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PLANTAE PAPUANAE ARCHBOLDIANAE, XVI*

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With eleven text-figures

THE FOLLOWING genera are considered in this article: *Urophyllum*, *Pachystylus*, *Canthium*, *Antirhea*, *Timonius*, *Mastixiodendron*, *Coffea*, *Ixora*, *Versteegia*, *Coprosma*, *Coelospermum*, *Morinda*, and *Galium*. We still have *Psychotria* and its closely related genera to be included in another paper, and that, we hope, will complete the Rubiaceae until such time as certain specialists can give the collections their attention.

RUBIACEAE (in part)

Urophyllum Wallich

Urophyllum umbelliferum Val. Nova Guin. Bot. 14: 262, t. 29A. 1925.

BRITISH NEW GUINEA: Fly River, 528 mile Camp, *Brass 6646*, May 1936, alt. 80 m., plentiful in undergrowth on ridges (tree 4 m. high; flowers green; ripe fruit black, fleshy, about 1 cm. long).

Described from Netherlands New Guinea. This collection is not so pubescent as the original, and the petioles are slightly longer than those shown in the plate, yet these are only minor variations. The calyx-lobes vary in length, being 2–4 mm.; in the open flower the corolla-tube is 4 mm. long and practically glabrous, and the lobes are 3–3.5 mm. long and pilose on the outside.

Pachystylus K. Schumann

Pachystylus Guelcherianus K. Schum. in Schumann & Hollrung, Fl. Kaiser Wilhelms Land 133. 1889; Schumann & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 574. 1900. *Tarennia Guelcheriana* (K. Schum.) Val. Bot. Jahrb. 60: 85. 1925.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, *Brass 13886*, Apr. 1939, alt. 120 m., rain-forest of lower mountain slopes (undergrowth tree 2.5 m. high). BRITISH NEW GUINEA: Oroville Camp, Fly River, *Brass 7401*, Aug. 1936, plentiful in rain-forest undergrowth (tree 2–3 m. high; flowers cream-colored).

Described from Northeast New Guinea, and previously reported from

* Botanical Results of the Richard Archbold Expeditions. See Jour. Arnold Arb. 26: 1–36. 1945.

Netherlands New Guinea. Although the genus was reduced to *Tarenna* Gaertner by Valetton, Bremekamp believes it should be maintained as a separate genus, and from our little available material we agree with his point of view.

Canthium Lamarck

Canthium suborbiculare (White) comb. nov.

Plectronia suborbicularis White, Proc. Linn. Soc. N. S. Wales 51: 296, t. 17. 1926, Jour. Arnold Arb. 10: 268. 1929.

Known only from Papua.

Canthium cymigerum (Val.) B. L. Burtt, Kew Bull. 1936: 463. 1936.

Plectronia cymigera Val. Bot. Jahrb. 61: 54. 1927.

NORTHEAST NEW GUINEA: Maboro, *Schlechter* 19513, May 20, 1909, in forest. SOLOMON ISLANDS: Bougainville: Kugimaru, Buin, *Kajewski* 1805, June 1930, alt. 150 m., rain-forest (tree up to 20 m. high; leaves dark glossy green; fruit 9 mm. long, 1.2 cm. broad, 6 mm. thick); Koniguru, Buin, *Kajewski* 2111, Aug. 1930, alt. 900 m., rain-forest (tree up to 10 m. high; fruit 6 mm. long, 1 cm. broad); Ysabel: Tasia, *Brass* 3286, Dec. 1932, coastal rain-forests (small tree with drooping branches; leaves shining, the lower surface very pale; flowers white).

In the original publication of this species the type-number is given as 17513, so that either the number on our duplicate was copied wrong or there was an error in publication. It does not seem possible that both *Schlechter's* numbers could have been collected in the same place in the same month, unless an exceptionally large collection was made. There are two unbroken leaf-tips in the *Schlechter* specimen cited which tend to be broadly and obtusely acuminate. In the Solomon Islands material the leaves are ovate-elliptic, up to 10 mm. broad, more abruptly rounded at the base, and rather abruptly obtusely acuminate.

Canthium odoratum (Forst. f.) Seem. Fl. Vit. 132. 1866.

Coffea odorata Forst. f. Prodr. 16(no. 94). 1786.

BRITISH NEW GUINEA: Mabaduan, *Brass* 6539, April 1936, common in small scrubby rain-forest patches in savanna-forests (tree 5-6 m. high).

This fruiting collection shows a very close resemblance to the Polynesian material. The secondary venation of the leaves is more obvious in the material above cited than in the other specimens at hand, the fruit is more strongly rugose on the outside, and the semicircular pyrenes have a very deep indentation on the inner surface.

Canthium graciliflorum sp. nov.

Arbuscula 4-5 m. alta; ramulis ultimis 4-angulatis demum subrotundatis, minute puberulis, internodiis 1.5-4 cm. longis; stipulis valde inaequalibus, altera 2 mm. longa, altera 4 mm. longa, basi latis, ensiformibus; foliis lanceolatis utrinque angustatis, 3-4.7 cm. longis, 1-1.8 cm. latis, apice anguste obtusis, basi in petiolo 2-3 mm. longo attenuatis, subcoriaceis, supra subnitidis, olivaceis, subtus opacis, interdum costa versus basim minute puberulis, ceterum glabris, nervis lateralibus utrinsecus \pm 4 oblique adscendentibus marginem versus arcuatim confluentibus, utrinque inconspicuis; corymbis axillaribus bifurcatis vel trifurcatis, 1.5-1.7 cm. longis latisque; floribus plerumque breviter pedicellatis; ovario subgloboso glabro

vix 1 mm. longo; calycis limbo brevissimo, minute 5-dentato; corollae tubo 1 mm. longo, fauce pilis reflexis barbato, lobis 2.5 mm. longis, linearibus, patentibus vel reflexis; staminibus fauce insertis, filamentis 1.5 mm. longis, antheris sagittatis, 1.5 mm. longis, apice apiculatis; stylo circiter 4 mm. longo; stigmatе mitriforme, apice bilobato; fructibus non visis.

BRITISH NEW GUINEA: Tarara, Wassi Kussa River, *Brass 8596* (TYPE), Dec. 1936, common and conspicuous in brushy rain-forest fringing river (slender tree 4–5 m. tall; branches semi-erect; leaves smooth and shining; very numerous cream-colored flowers).

This species is related to *Canthium odoratum* (Forst. f.) Seem., but the leaves are narrower and without domatia; the inflorescence is much shorter and the flowers are slightly smaller in all the parts. In some ways, particularly in the outline of the leaves and their tendency to shine, the plant suggests one passing in Australia as *Canthium lucidum* Hook. & Arn., which perhaps more correctly should be known as *C. lamprophyllum* F. v. Muell. Here again in comparison the Papuan material is less coarse in every way than the Queensland collections. In the Gray Herbarium is a small fragment from Hooker's herbarium collected on Gambier Island by Beechey labelled *C. lucidum* Hook. & Arn. The fragment is probably from the type or an isotype and there is no question in our minds that it is identical with *C. odoratum* (Forst. f.) Seem., but it is scarcely the same as the Australian material so-named.

Canthium brevipes sp. nov.

Arbuscula 3–5 m. alta; ramulis in sicco atro-cinereis vel brunnescentibus, novellis nigrescentibus, glabris, internodiis 2–4 cm. longis; stipulis brevibus, 1–2 mm. longis, caducis; foliis ellipticis vel oblongo-ellipticis, 7–12 cm. longis, 2.2–4.5 cm. latis, utrinque aequaliter angustatis, apice obtusis vel obtuse acuminatis, basi cuneatis, chartaceis, in sicco supra atro-fuscis, subtus olivaceis, glabris, nervis lateralibus utrinsecus 6–8 utrinque manifestis non prominulis in axillis domatia minuta foventibus; floribus in tuberculis axillaribus 1–9-umbellatis; pedicellis 2–3 (–6 in fructu) mm. longis; ovario subglobozo, cum calyce \pm 1.5 mm. longo; calycis tubo inconspicuo, margine minute dentato ciliato; corollae tubo 3–4 mm. longo intus retrorse pubescente, fauce et lobis basi villosis, lobis 2.2–2.5 mm. longis, lanceolatis acutis; antheris circiter 1 mm. longis, sessilibus, in fauce insertis, apice mucronatis; stylo glabro, 4 mm. longo; stigmatе mitriforme, apice \pm reflexo; fructibus usque 1.9 cm. latis et 1.1 cm. longis, divaricatis bilobatis facie fructum *Guioae* adnatis; pyrenis extus rugulosis, oblique semirotundis latere ventrali incis; seminibus valde curvatis.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *Brass 7470*, Aug. 1936, rain-forest, common in lakeshore undergrowth (tree 3–5 m. high; fruit red); Penzara, between Morehead and Wassi Kussa Rivers, *Brass 8443* (TYPE), rain-forest (small tree fringing a permanent waterhole; flowers yellow).

Canthium brevipes is closely related to *C. Valetonianum* S. Moore, if we have rightly interpreted the latter species. In the former the veins of the leaves are closer together; the fruit is broader and at the apex has a broad shallow depression not characteristic of Moore's species. At a glance the fruit somewhat suggests that of certain species of *Guioa* in contour; in fruit the pedicel is only 6 mm. long, whereas in the other species which we

have seen the pedicel has elongated to 1 cm. or more in length. This group of species with umbellate flowers needs a revision from a specialist's point of view.

Canthium korrense (Val.) Kanehira, Bot. Mag. Tokyo 46: 671. 1932.

Plectronia korrensis Val. Bot. Jahrb. 63: 311. 1930.

SOLOMON ISLANDS: Florida (N'Gela): North end of the island, *Brass* 3510, Jan. 1933, alt. 75 m., hill rain-forests (tree 5 m. tall, with close gray bark; flowers white or pale yellow; fruit smooth, pale red); Guadalcanal: Mamassa, Konga, *Kajewski* 2479, Feb. 1931, alt. 400 m., rain-forest (tree up to 18 m. high, on banks of freshwater creeks; fruit dull red when ripe, 1.2 cm. long, 1.4 cm. broad).

This material seems to be a very good match for the description and material collected at Ponape. The flowers are perhaps nearer 6 mm. long rather than 4 mm. as given in the original description.

Canthium longiflorum (Val.) comb. nov.

Plectronia longiflora Val. Bot. Jahrb. 61: 56. 1927.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, *Brass* 13971, Apr. 1939, alt. 50 m., rain-forest subject to occasional flooding (undergrowth tree 6 m. tall; flowers white). BRITISH NEW GUINEA: Tarara, *Brass* 8509, Dec. 1936, common in rain-forest undergrowth (shrub 2 m. high; fruit pink).

Described from Northeast New Guinea. The second specimen cited is in fruit only but seems to fit better here than elsewhere at present.

Canthium Schlechterianum nom. nov.

Plectronia nitens Val. Bot. Jahrb. 61: 57. 1927.

NORTHEAST NEW GUINEA: Yoangen, *Clemens* 6492, June 1937, alt. about 1250 m.

This collection agrees with Valeton's description except that the corolla-lobes are about 12 mm. long rather than 5 mm. The specific epithet *nitens* is pre-empted in the genus *Canthium*. The species is known only from New Guinea, and only in the flowering stage.

? **Canthium megistocarpum** sp. nov.

Arbor parva; ramulis brunnescentibus, novellis in sicco atro-olivaceis, glabris; internodiis 3–7.5 cm. longis; stipulis inaequalibus, 5–10 mm. longis, basi latis, ensiformibus; foliis oblongo-lanceolatis, 18–27 cm. longis, 5.5–7.5 cm. latis, apice longe acuminatis, acumine 1–2 cm. longo, basi cuneatis, chartaceis, glabris, nervis lateralibus utrinsecus 8 vel 9 supra leviter impressis, subtus prominulis, venis inconspicue manifestis, laxis; petiolo circiter 9 mm. longo; floribus non visis; fructibus pyriformibus, in sicco 7 cm. longis, 4.5 cm. diametro; pyrenis 2, endocarpio osseo extus irregulariter tuberculato; semine pendulo ad tertium superum ovarii longitudinalis affixo.

NETHERLANDS NEW GUINEA: 2 km. southwest of Bernhard Camp, Idenburg River, *Brass* 13476 (TYPE), March 1939, alt. 800 m., small tree of rain-forest substage (large pyriform green pithy fruit up to 10 cm. long and 7.5 cm. in diameter).

This species may be related to *Canthium Schlechterianum* Merr. & Perry (*Plectronia nitens* Val.), but up to the present the only comparable parts are the foliar characters, one having very large flowers, the other very large fruits. Valeton's species, if we have correctly interpreted it, has equal stipules and firmer, broader, and shorter leaves with shorter petioles. Supplementary material of both species is greatly needed.

? *Canthium aurantiacum* sp. nov.

Arbor parva, usque 5 m. alta; ramulis novellis atro-fuscis, glabris; internodiis 1.5–3 cm. longis; stipulis subaequalibus, 5–10 mm. longis, basi latis, apice elongato-ensiformibus; foliis oblango-lanceolatis, 12.5–14.5 cm. longis, 3.7–4.5 cm. latis, apice breviter acuminatis, acumine obtusiusculo, basi anguste cuneatis vel acutis, glabris, coriaceis, nervis lateralibus utrinsecus 6–8 oblique adscendentibus, utrinque manifestis non prominulis, venis obscuris; petiolo circiter 8 mm. longo; floribus non visis; tuberculis in axillis foliorum 2- vel 3-cicatricosis; fructibus in sicco obovoideis 4 cm. longis, 2.5 cm. diametro, leviter rugulosis; pyrenis 2, endocarpio osseo extus irregulariter tuberculato; semine pendulo ad tertium superum ovarii longitudinis affixo; embryo 2.5 cm. longo, teretiusculo, recto, cotyledonibus brevibus, radícula supera.

BRITISH NEW GUINEA: Kubuna, *Brass* 5580 (TYPE), Nov. 1933, alt. 100 m., ridge-forest substage (small tree 5 m. high; leaves thick, smooth; fruit solitary in axils, orange-yellow, about 4.5 cm. long, 3 cm. or more in diameter).

The leaves of this species are smooth and thicker than are those of most species of *Canthium* from New Guinea; the tubercles in the axils of the leaves are very short and have 2 or 3 scars on the ends, probably indicating the number of flowers or fruits borne there. The fruit is very large compared with that of the other New Guinean species except one, but *C. glabrum* Bl. of Malaysia has fruit as large or larger. In the latter species, however, the leaves are larger, thinner, and broader than in the New Guinean material.

Antirhea Commerson

S. Moore, *Jour. Bot.* 65: 266. 1927, and Fosberg, *Sargentia* 1: 121. 1942, include within their concept of the genus *Timonius* DC. plants with fruits characterized by a 4–10-loculed putamen. The latter character, coupled with a persistent calyx and a corolla with imbricate lobes, belongs to the concept of the genus *Antirhea* Commers. As far as we may judge from the material at hand the genus is a valid one. Valetton, *Bull. Dép. Agr. Ind. Néerl.* 26: 12. 1909, indicates the similarity of the inflorescences in the entire tribe Guettardeae, in which case one would naturally look for generic differences in the fruits. S. Moore simply indicates that *Brass* 946 is apparently a new species of *Timonius*, suggesting its resemblance to *T. subcoriaceus* Val. but noting that the center of the fruit is occupied by a star-shaped woody mass containing 9 pyrenes. We believe that another genus is represented when the fruit contains a putamen (a hardened concrete mass containing the seeds) or, as Fosberg calls it, a fused stone. In the case of *Timonius Kajewskii* (Guill.) Fosb., at least as to the fruiting specimen cited by Fosberg, the pyrenes cohere very closely, but the walls of the adjoining pyrenes maintain their identity; this is apparent in a cross-section of the fruit which shows a definite line between adjacent pyrenes. In *Timonius Smithii* Fosb., from Fiji, the fruit does not contain separate pyrenes as such, but a putamen with 10 locules. Since the latter is a character of *Antirhea* Commers. rather than of *Timonius* DC., the Fijian plant should be called *Antirhea Smithii* (Fosb.) comb. nov. (*Timonius Smithii* Fosb. l.c.).

Antirhea tenuiflora Benth. Fl. Austr. 3: 418. 1867; F. M. Bail. Queensl. Fl. 3: 760. 1900.

BRITISH NEW GUINEA: Tarara, Wassi Kussa River, *Brass* 8525, 8585, Dec. 1936, common in undergrowth of rain-forest (shrub of weak habit 2-5 m. high; leaf-nerves pale; flowers white; fruit red, ovoid).

These collections are intermediate between two Queensland specimens in our herbarium and agree reasonably well with the description of this species. This seems to be the first record of the presence of the genus in New Guinea.



FIG. 1. A. *Morinda costata* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. leaf, $\times \frac{1}{2}$. B. *Antirhea megacarpa* Merr. & Perry: a. leaf and terminal bud, $\times \frac{1}{2}$; b. enlarged portion of leaf to show detail of venation; c. fruit, $\times \frac{1}{2}$; d. cross-section of fruit, $\times \frac{1}{2}$.

Antirhea megacarpa sp. nov. FIG. 1, B.

Arbor \pm 9 m. alta; ramulis cinereis, novellis compressis, internodiis 1.5-5 cm. longis; supra juxta cicatricem novellam stipularum hirtellis; stipulis 6 mm. longis, carinatis, pubescentibus, cito caducis; alabastris lateraliter compressis; foliis ellipticis utrinque angustatis, 8-20 cm. longis, 3-9 cm. latis, apice obtuse acuminatis, basi cuneatis, chartaceis, supra glabris, subtus costa nervisque consperse adpresse hirtellis, nervis lateralibus utrinsecus \pm 9 adscendentibus et arcuatis, supra impressis, subtus prominulis, venis irregulariter positis, utrinque tenuiter prominulis, reticulo laxo, subtus areolis subparallele striatulis; petiolo 1.2-2.5 cm. longo; floribus non visis; fructibus ovoideis, 3.8 cm. longis, 2.5 cm. diametro, calycis lobis (1.5 mm. longis) coronatis; mesocarpio fibris praedito; putamine duriusculo, valde et irregulariter longitudinaliter 8- vel 9-costato, 10-loculato, 3 cm. longo, 1.7 cm. diametro.

BRITISH NEW GUINEA: Ihu, Vailala River, *Brass* 946 (TYPE), Feb. 1926, rain-forest (tree 30 feet tall; bark thick, dark and flaky; flowers solitary, axillary; fruit red).

This plant is so very different from any of the species of *Antirhea* Commers. described from the southwestern Pacific that, in spite of the lack of

flowers, we have described it. The very large fruit and the rather prominent venation of the leaves are its best characters.

Timonius de Candolle

In our work here we are accepting the older concept, also adopted by Valetton, that *Timonius* DC. has fruits with numerous pyrenes, and retaining in *Guettarda* L. and *Antirhea* Commers. those plants having fruits with a 4–10-loculed putamen. Of the approximately 50 species of *Timonius* DC. already described from Papuasias, we believe there are 18 species represented in the Papuasian material at hand. Not finding ourselves able to match the remaining collections with the descriptions, they are here presented as new. *Timonius merokensis* Wernham ought to be re-examined as to generic status. The few pyrenes with very small seeds (suggesting thick walls) call to mind the genus *Bobea* Gaudich., or rather *Nelitris* Gaertner, since the latter is the earlier published name. There is considerable variation in the number of pyrenes, and it has not always been easy to express the arrangement of the pyrenes within the fruit. In transverse section across the middle of the fruit, pyrenes may appear to be vertical, horizontal, or obliquely arranged. Most fruits in which the pyrenes are vertical do not have a very large number of pyrenes, and these may be massed, as it were, in the center of the fruit with a fairly fleshy sarcocarp surrounding them, or they may be distributed nearer the margin, the center of the fruit apparently being more or less spongy; fruits usually with numerous pyrenes may show them in horizontal position (if the pyrenes are abundant enough) or obliquely pendulous, those in the lower part of the fruit, of course, being always pendulous and vertical. Seemingly very early in the development of the flower the locules lose their identity as such, and hence the number, which we believe in most cases agrees with the number of stigmas, is not given in our descriptions. In some instances where the pyrenes appear to be vertical we have counted them in the cross-section; in the others, unless the pyrenes were fairly large and could easily be counted separate, we have tried to give the number of rows in the cross-section and also the number from the apex to the base as they appear in a longitudinal section. In any case, we again note the considerable variation in number.

Timonius avenis Val. Bull. Dép. Agr. Ind. Néerl. 26: 46. 1909, Nova Guin. Bot. 8: 473, t. 724. 1911, Bot. Jahrb. 61: 36. 1927.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, *Brass* 12913, Feb. 1939, alt. 1200 m., rain-forest epiphyte (tree 5 m. tall); 4 km. southwest of Bernhard Camp, Idenburg River, *Brass* 13310, March 1939, alt. 900 m., frequent in open situations in mossy forest (slender tree 5–7 m. high); same locality, date, and altitude, *Brass* 13628, common high epiphyte in rain-forest (tree 5 m. high; branches upright; leaves concave). BRITISH NEW GUINEA: Mount Tafa, *Brass* 5046, Sept. 1933, alt. 2400 m., common in valley and lower slope forests (tree 15–20 m. high, with dense pale foliaged crown, *Ficus*-like in appearance; leaves thin, glabrous, glossy, pale beneath, obscurely nerved; flowers white; fruit compressed, fleshy, dark shining red).

The first three collections cited unquestionably belong to the same

species. The leaves are much stiffer than those of the plants which we take for typical *T. avenis* Val. but they do not differ essentially from the description or the plate. The collection from Mount Tafa has more obtuse leaves than those from Netherlands New Guinea, the peduncles and the calyces are somewhat shorter, and the upper surface of the leaves is not so definitely striate as in typical *T. avenis* Val. As we do not have much material for comparison, it seems best for the present to place the collection here.

***Timonius pubipetalus* (Val.) comb. nov.**

Timonius avenis var. *pubipetalus* Val. Bot. Jahrb. 61: 37 (as *pubipetala*). 1927.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 12592*, Feb. 1939, alt. 1200 m., rare on slopes of primary forest (tree 18 m. tall, 39 cm. diameter; wood dark red; flowers white); same locality, date, and altitude, *Brass 12878*, subsidiary tree in rain-forest (22 m. high; leaves pale beneath; flowers white); 4 km. southwest of Bernhard Camp, Idenburg River, *Brass 13687*, March 1939, alt. 850 m., bank of rain-forest stream (much branched tree 10 m. high; flowers brownish). BRITISH NEW GUINEA: Fly River, 528 mile Camp, *Brass 6804*, May 1936, alt. 80 m., epiphyte in forest-canopy (small tree or shrub; stipules and corolla pubescent).

Brass 6804 differs from the other collections cited in having definitely whitish pubescent terminal buds, and the upper surface of the leaves is lightly striulate; the fruits are deeply 6-8-sulcate. The other collections are all staminate; all the corollas are pubescent; the leaves are larger than given for the type, 5.5-12 cm. long, 1.5-3.5 cm. broad, and the cuticle is not striate on the upper surface. The material seems to be quite distinct from *Timonius avenis* Val. as we understand that species. In *Brass 12878* the terminal bud is slightly appressed-pubescent.

***Timonius belensis* sp. nov. FIG. 2, A.**

Arbor 12-19 m. alta, glaberrima; ramulis fuscis; internodiis 1.5-6 cm. longis, novellis valde compressis; stipulis 3-5 cm. longis, oblongo-lanceolatis sensim acuminatis; foliis oblongo-oblanco-latis vel anguste ellipticis, 5.5-15 cm. longis, 1.8-5.5 cm. latis, apice acutis, basi cuneatis, in petiolo angustatis, tenuiter coriaceis, costa supra impressa, subtus prominente, nervis lateralibus utrinsecus 7-9 utrinque vix perspicuis, cuticula striata, striis ut nervis fere aequaliter manifestis; petiolo 0.6-2 cm. longo; inflorescentiis ♂ non visis; floribus ♀ solitariis axillaribus, pedunculatis, pedunculo 5-7 mm. longo; ovario et calyce urceolato, calyce vix 1 mm. longo, membranaceo, truncato; corollae tubo 4 mm. longo, 2 mm. lato, lobis 10-12, oblongo-linearibus, acutis, 3 mm. longis; staminibus 10-12, 3 mm. longis, apice vix exsertis; fructibus depresso-globosis, 7 mm. longis, 10 cm. diametro, apice calycis tubo brevi coronatis; pyrenis ± 72 vel multis, fere verticalibus, exterioribus paulo obliquis.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, *Brass & Versteegh 11110*, Nov. 1938, alt. 2250 m., frequent substage tree of primary forest (tree 19 m. high, 31 cm. diameter; bark gray-brown; fruits green); same locality, *Brass 11527* (TYPE), Nov. 1938, alt. 2400 m., common in old secondary forest (tree 12-15 m. high).

This species is an ally of *Timonius avenis* Val.; it has much larger leaves, striate on both surfaces, and inconspicuous primary veins. The foliar characters appear to be more clearly cut than those of the flower or fruit.

Timonius modestus sp. nov. FIG. 2, B.

Arbor parva epiphytica, alabastris, corollis et interdum pedunculis puberulis vel cinereo-pubescentibus exceptis glabra; internodiis 1–4 cm. longis, novellis compressis; stipulis usque 5.5 cm. longis, oblongo-lanceolatis, longe acuminatis, extus praecipue secus mediam cinereo-puberulis vel pubescentibus interdum glabris; margine \pm vernicosis; foliis tenuiter coriaceis vel valde chartaceis, ellipticis vel leviter obovatis, 4–12 cm. longis, 2–6.5 cm. latis, apice minute et obtuse acuminatis, vel breviter acutis, basi cuneatis vel in petiolum angustatis, latissimis paulo ultra medium, in sicco margine saepissime leviter crispulis, nervis lateralibus occultis, cuticula supra dense striata, subtus strii vix manifestis; petiolo 0.8–1.5 cm. longo; inflorescentiis axillaribus, pedunculatis, pedunculo usque 1.5 cm. longo, δ ramosis, 5–7-floris; floribus sessilibus; calyce glabro, tubulato, 2 mm. longo, trun-



FIG. 2. A. *Timonius belensis* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. longitudinal section of fruit, $\times 1$. B. *Timonius modestus* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. longitudinal section of fruit, $\times 1$.

cato; corollae tubo 1 cm. longo, extus pubescente, lobis 4, ovatis, obtusis vel acutiusculis, extus pubescentibus, 3 mm. longis; antheris 7 mm. longis, apice tantum exsertis; stylo 3 mm. longo; floribus η solitariis, ovario et calycis tubo urceolatis, 4 mm. longis; corollae tubo extus pubescente, 4–5 mm. longo, lobis 8 oblongis, 3.5 mm. longis, extus pubescentibus; stylo crasso, 6 mm. longo stigmatibus 8 terminato; fructibus depresso globosis, circiter 1 cm. diametro; pyrenis probabiliter ± 90 , oblique pendulis, longitudinaliter ex apice ad basim 6 compacte superpositis, parvis.

BRITISH NEW GUINEA: Fly River, 528 mile Camp, Brass 6748 (TYPE), May 1936, alt. 80 m., common in forest-canopy (epiphytic small tree; flowers white; immature fruit obscurely ribbed, somewhat compressed); Palmer River, 2 miles below junction Black River, Brass 7076, June 1936, alt. 100 m., small epiphytic tree common in forests.

This species closely approaches *Timonius avenis* Val. but it has pubescent buds and corollas, larger leaves, and pyrenes more obliquely arranged than in Valetton's species.

Timonius carstensensis Wernh. Trans. Linn. Soc. II. Bot. 9: 73. 1916.

BRITISH NEW GUINEA: East Mount Tafa, *Brass* 4077, May 1933, alt. 2350 m., edge of a small burnt-over clearing in mossy forest (erect branching bush 2 m. tall; branches shining gray-brown; leaves thick, pale green; flowers white; fruit green, somewhat compressed, costate); Murray Pass, Wharton Range, *Brass* 4705, Aug. 1933, alt. 2840 m., one of the rarer forest trees (spreading pale-barked tree, in appearance much like a *Ficus*; leaves above dark and shining, beneath yellowish; flowers white).

Until these can be compared with the type, it seems better to place the two cited collections here rather than elsewhere. In one collection the stipules are densely appressed-villous inside, while in the other they seem to be glabrous except for the colleters at the base.

Timonius scabriflorus (Val.) comb. nov.

Timonius avenis var. *scabriflorus* Val. Bot. Jahrb. 61: 37 (as *scabriflora*). 1927.

NORTHEAST NEW GUINEA: Yunzaing, *Clemens* 3568 bis (perhaps an error for 3586 bis), 3586A, July 1936, alt. 1350 m., in forest.

Fortunately we have at hand an isotype of Valetton's variety. It seems preferable to us to consider it as worthy of specific rank. It is true that the upper surface of the leaves is striulate much as in *Timonius avenis* Val., but the pubescence on the lower surface, the branchlets, the terminal buds, the floral axes, the petioles, and the corolla is a considerable departure from that of the species. In addition, the staminate flowers appear to have the anthers included, and the pyrenes are obliquely pendulous from the central column of the fruit. The staminate inflorescence has 3–5 flowers; peduncle 3–5 mm. long, the branches about 3 mm. long; calyx membranous, about 1 mm. long, truncate; corolla not yet in full anthesis, outside shortly hirsute to the tips of the lobes, the tube cylindric or slightly narrowed at the throat, 9 mm. long, the lobes ovate, acute, 3 mm. long; anthers 6 mm. long, inserted about 4 mm. above the base of the corolla, but included as indicated by the slightly constricted throat of the corolla, the style about 4 mm. long, glabrous. In one fruit 90 pyrenes were counted, in the longitudinal section of another there were 6–7 pyrenes from the apex to the base of the fruit. In a cross-section of the fruit the pyrenes tend to slide apart at an oblique angle rather than be cut directly across as in *T. avenis* Val.

Timonius trichanthus sp. nov. FIG. 3, C.

Arbor parva; ramulis fusco-cinereis, apicem versus dense et breviter hirsutis, pilis patentibus, internodiis 1–4 cm. longis, novellis compressis; stipulis 1.5–3 cm. longis dense patenti-hirsutis, oblongo-lanceolatis, acuminatis; foliis 4.5–11 cm. longis, 1.5–4 cm. latis, anguste ellipticis vel oblongo-lanceolatis, apice breviter acuminatis vel acutis, basi cuneatis vel obtusis, tenuiter coriaceis, supra glabris vel costa puberulis, subtus (costa densius) regulariter haud dense breviter hirsutis; costa supra impressa, subtus prominente, nervis lateralibus utrinque obscuris; petiolo 6–12 mm. longo, hirtello; inflorescentiis axillaribus, pedunculatis, ♂ saepissime 5-floris; pedunculo 5 mm. longo hirtello, ramis circiter 4 mm. longis; calyce truncato, 1.5 mm. longo, hirsuto; corolla tantum in alabastro visa, tomentella, crassiuscula, tubo 4 mm. longo, lobis 4, obtusis, 2 mm. longis; antheris 3.5 mm. longis in tubo medio insertis, in anthesi exsertis; stylo 2 mm. longo; floribus ♀ solitariis; pedunculo 1–1.5 cm. longo, hirtello; ovario

glabro 3 mm. longo; calyce truncato, 1 mm. longo, hirsuto; corolla in alabastro tantum visa, tomentella, crassiuscula, tubo 6 mm. longo, lobis 6, 2 mm. longis; antheris 6, 2.5 mm. longis, in parte superiore tubi insertis vix exsertis; stylo crassiusculo, 5 mm. longo, stigmatibus 6 terminato, glabro; fructibus depresso globosis, calycis tubo coronatis, 6 mm. longis, 7 mm. diametro, 6-sulcatis; pyrenis 45, verticalibus.

NORTHEAST NEW GUINEA: Ogeramang, *Clemens* 4747, Dec. 1936, alt. \pm 1750 m., along trail; vicinity of Bulung River, Nomanenem Camp, *Clemens* 5206, Jan. 1937, alt. 900–1500 m., hill trail; Matap, *Clemens* 11158B (TYPE, isotype in Herb. Univ. Michigan), Feb.-Apr. 1940, alt. 1500–1800 m. (tree 7–10 cm. diameter; flowers white; fruit green).

This species is closely related to *Timonius scabriflorus* (Val.) Merr. & Perry. It may be distinguished by the difference in the leaf-outline; in the latter species the leaves are more sharply tapering both toward the apex and the base, the pubescence is of shorter hairs, the terminal buds tend to be much less shaggy in appearance, the calyx is glabrous, and the pyrenes are obliquely pendulous, while the δ flower-buds are fairly sharply acute. In our species, on the other hand, the leaves are not so sharp toward the apex and the base, the terminal buds are shaggy to the naked eye, the calyx is pubescent with fairly long appressed hairs, the pyrenes are vertical and completely fill the cross-section of the fruit, being about half as many as in the other species, while the δ flower-buds are obtuse.

Timonius trichanthus var. *dolichophyllus* var. nov. FIG. 3, D.

Foliis elongatis, oblongo-lanceolatis, 7–17 cm. longis, 1.5–4.5 cm. latis, alabastro terminali adpresse sericeo-pubescente.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, *Brass* 12398 (TYPE), Jan. 1939, alt. 1500 m., rain-forest, common on banks of a stream (spreading, 5–6 m. high).

Apart from the longer and narrower leaves and the appressed sericeous pubescence of the terminal bud, this collection seems to agree with the type of the species. The calyx is slightly less pubescent, but the pubescence is present on most of the young fruits and the pyrenes show the same regular arrangement which characterizes the species.

Timonius trichocladus sp. nov. FIG. 3, B.

Arbor usque 18 m. alta; ramulis dense hispidulis, cinereis, internodiis 1–5 cm. longis, valde compressis; stipulis glabris, usque 3 cm. longis, oblongo-lanceolatis, acuminatis; foliis oblongo-lanceolatis vel obovato-lanceolatis, 3–9.5 cm. longis, 1.5–3.5 cm. latis, apice acutis vel breviter acuminatis, basi \pm anguste cuneatis vel in petiolo attenuatis, in sicco margine leviter recurvis, tenuiter coriaceis, supra glabris, cuticula patentistriata (striis subparallelis hinc inde flexis), subtus glabris vel costa accumbente pilosis, cuticula inconspicue striata, margine versus basim interdum pilosis, nervis lateralibus obscuris; petiolo 5–10 mm. longo, sparsim piloso vel glabro; inflorescentiis axillaribus, pedunculatis, pedunculo 6 mm. longo, glabro vel sparsim pubescente, δ trifloris, flore medio sessili, lateralibus pedicellatis; floribus glabris, calyce tubulato, 2 mm. longo, truncato vel minute dentato; corollae tubo 7 mm. longo, lobis 4 mm. longis, ovatis, acutiusculis; antheris 4 partim exsertis; stylo brevi; flore φ solitario; calyce truncato, 1.5 mm. longo; corolla (in alabastro) 6 mm. longa, tubo

4 mm. longo, lobis 5, ovatis, acutiusculis; antheris inclusis; stylo 4 mm. longo, glabro, crassiusculo; stigmatibus 5 brevibus; fructibus globosis, circiter 1 cm. diametro; pyrenis verticalibus, 25–30 vel pluribus.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass 9504*, Aug. 1938, alt. 3225 m., common tree in mossy closed forest of more sheltered hollows (8–10 m. tall; leaves convex; flowers white); same locality, *Brass 9505* (TYPE), Aug. 1938, alt. 3225 m., locally abundant in forest undergrowth (tree 3 m. high; leaves somewhat convex; flowers white; fruit black, laterally compressed, \pm 1.1 cm. long); 9 km. northeast of Lake Habbema, *Brass & Versteegh 10486*, Oct. 1938, alt. 2950 m., rare in old secondary forest (tree 15 m. tall, 29 cm. diameter; flowers white); same locality, *Brass 10568, 10642*, alt. 2800 m., rare in mossy forest, common in old secondary forest (tree 5–15 m. high); same locality, *Brass & Versteegh 11102*, Oct. 1938, alt. 2700 m., rare in mossy forest (tree 18 m. high, 29 cm. diameter; bark rough, brown; fruits green).

This species certainly belongs to the same alliance as *Timonius avenis* Val. Its most striking character is the coat of dense short rather stiffish spreading hairs covering the upper part of the branchlets. The striations



FIG. 3. A. *Timonius virgatus* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. leaf, $\times 1$, showing detail of venation. B. *Timonius trichocladus* Merr. & Perry: habit, $\times \frac{1}{2}$. C. *Timonius trichanthus* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. leaf, $\times \frac{1}{2}$, showing lower surface. D. *Timonius trichanthus* var. *dolichophyllus* Merr. & Perry: leaf, $\times \frac{1}{2}$, showing lower surface.

on the upper surface of the leaf are not so close together as in *T. avenis* Val., spreading in direction rather than ascending, and not quite so distinct. The lower surface may be glabrous or on the midrib especially toward the base of the leaf may be seen weak accumbent hairs, a continuation of those on the petiole, as it were; the same type of hair also appears on the very lower margin in younger leaves, but in some specimens both leaves and petioles are glabrous.

Timonius virgatus sp. nov. FIG. 3, A.

Frutex epiphyticus, 1–1.5 m. altus; ramis cinereis, ramulis ultimis gracilibus 1 mm. diametro, hirtellis, compressis, sub foliorum insertione manifeste

incrassato-nodosis, internodiis 1–2 cm. longis; stipulis glabris vel apice barbatis, 4–6 mm. longis, attenuatis, cito caducis; foliis tenuiter coriaceis, lanceolatis, 1–3.8 cm. longis, 0.4–1 cm. latis, apice caudato-acuminatis, acumine 0.5–1.3 cm. longo in parte inferiore 2–3 mm. lato, basi subrotundatis vel obtusis, in sicco margine leviter revolutis, utrinque glabris vel subtus costa adpresse hirtellis, nervis lateralibus infra medium folium utrinsecus 2 utrinque submersis, in axillis barbellatis, sursum nullis, venis obscuris, cuticula utrinque striulata vel minute lineato-rugosa; petiolo 1–2 mm. longo; inflorescentiis ♂ trifloris, floribus bracteatis, lateralibus pedicellatis, flore medio sessili; pedunculo \pm 1 cm. longo, glabro; calyce 4-dentato, 1–1.5 mm. longo, glabro; corollae tubo (sub anthesin) 6 mm. longo, glabro, lobis ovatis obtusis, 1 mm. longis, extus pubescentibus; antheris 2.5 mm. longis, apice exsertis; stylo 4 mm. longo; floribus ♀ solitariis, pedunculatis, bracteatis, bracteis crassiusculis, ovatis, 1 mm. longis; pedunculo \pm 1 cm. longo, glabro; ovario et calyce 2.5 mm. longo, calyce 4-dentato, dentibus acutis; corollae tubo 7 mm. longo, glabro, lobis obtuse ovatis, 1.5 mm. longis latisque, extus pubescentibus; antheris 2 mm. longis, inclusis; stylo 8 mm. longo, consperse pilosulo, stigmatibus 4 vel 5 terminato; fructibus haud carnosus, ovoideis, circiter 5 mm. diametro, calyce coronatis; pyrenis \pm 14, verticalibus, confertis.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, *Brass 12404* (TYPE), Jan. 1939, alt. 1800 m., very common epiphyte in mossy forest (weak, straggling shrub 1–1.5 m. tall; flowers red; fruit immature).

Three already described species, *Timonius filipes* Wernh. and var. *acuminatissima* Wernh., *T. caudatus* Val., and *T. minutifolius* Val., are very closely connected with *T. virgatus*. In leaf-size our species falls within the limits of that given for *T. caudatus* Val., which in turn overlaps the measurement of the smaller leaves of *T. filipes* Wernh. and the largest leaves of *T. minutifolius* Val. In all three the ovary is hairy, while in *T. virgatus* the ovary is glabrous, as is also the corolla-tube, even in bud only the lobes being sericeous on the outer surface; the leaves are equally striulate on both surfaces. A comparison of the types as well as a series of collections are really necessary to determine what are really specific differences and what are only environmental variations.

Timonius longitubus sp. nov. FIG. 4, B.

Arbor epiphytica vel terrestris; ramulis crassiusculis 4–7 mm. latis, obtuse angulatis vel compressis; internodiis brevibus, 7–10 mm. longis, novellis dense adpresse pubescentibus; stipulis 6–8 cm. longis, lanceolatis, attenuato-acuminatis, extus sparsim pilosis vel fere glabris, intus glabris, caducis; foliis ellipticis vel leviter obovato-ellipticis, 12–20 cm. longis, 6–9 cm. latis, in tertio supero latioribus, apice acutis vel brevissime acuminatis et interdum mucronatis, basi anguste cuneatis, glabris, tenuiter coriaceis vel chartaceis, nervis lateralibus utrinsecus 5–7 utrinque prominulis, adscendentibus et arcuatis, cuticula supra sub lente minute dense striatula, striulis in areolis parallelis, subtus levi; petiolo 2.5–3.5 cm. longo, atro-brunnescente; inflorescentiis axillaribus, ♂ semel dichotomis, pedunculo 1 cm. longo, ramis 1 cm. longis; floribus \pm 7, glabris, sessilibus; calyce subtubulato, 1 cm. longo, 4 mm. diametro, intus basi pubescente et glanduloso; corollae tubo 1.6 cm. longo, lobis 4, 9 mm. longis, linearibus; antheris 6 mm. longis, prope tubo

medio insertis; floribus ♀ solitariis, (alabastro tantum viso) glabris, pedunculo 1-2 cm. longo; ovario globoso 6 mm. diametro; calyce tubulato, 6 mm. longo; corolla 1.5 cm. longa, lobis 8; staminibus 16 (8 quam reliquis longioribus); stylo brevi, stigmatibus plurimis terminato serie duplici superpositis. 8 quam reliquis longioribus; fructibus in sicco 1-1.5 cm. diametro, globosis, apice calycis tubo coronatis; pyrenis numerosissimis, in fructu transverse secto ± 32 , longitudinaliter ex apice ad basim ± 20 compacte superpositis.

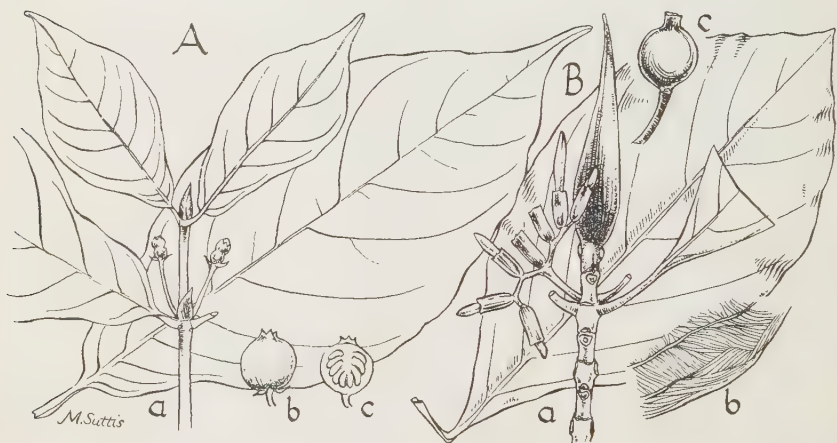


FIG. 4. A. *Timonius solomonensis* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. fruit, $\times \frac{1}{2}$; c. longitudinal section of fruit, $\times \frac{1}{2}$. B. *Timonius longitubus* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. enlarged portion of leaf to show detail of venation; c. fruit, $\times \frac{1}{2}$.

SOLOMON ISLANDS: Bougainville: Koniguru, Buin, *Kajewski* 2009, Aug. 1930, alt. 800 m., rain-forest, common (small tree growing as a parasite on larger trees; fruit pink when ripe, 2.5 cm. long, 2.5 cm. diameter, crowned by the tubular calyx); Ysabel: Kakatio, *Brass* 3244, Dec. 1932, alt. 900 m., rain-forest, common (small compact tree growing on other trees; leaves rather fleshy; stipules and falling leaves red; flowers cream-colored); Tiratona, *Brass* 3316 (TYPE), Dec. 1932, alt. 600 m., rain-forest, common (tree 15 m. tall; leaf-nerves very pale; flower white; fruit soft, fleshy, smooth, purple-red); Guadalcanal: Uulolo, Tutuve Mt., *Kajewski* 2541, April 1931, alt. 1200 m., rain-forest, common (small tree growing on a larger tree, usually from a cavity; fruit yellow-green when ripe, length 2 cm., diameter 1.9 cm.; for pains in the stomach the bark is macerated and applied to the affected spot).

We are at a loss at present to suggest a closely related species. *Timonius longitubus* appears to be readily distinguished by the rather long terminal bud, the glabrous character apart from the dense pubescence on the new internodes and the sparse pubescence of the stipules covering the buds, the long tubular calyx, and the very numerous and small pyrenes.

Timonius solomonensis sp. nov. FIG. 4, A.

Arbor parva gracilis; ramulis maturis pallidis glabris, novellis compressis, hirtellis, internodiis 1-3 cm. longis; stipulis triangularibus, breviter acuminatis, 5-7 mm. longis, basi 5-6 mm. latis, extus hirtellis, intus adpresse villosis, subpersistentibus; foliis ellipticis vel obovatis, chartaceis, 6-19 cm.

longis, 3–8.5 cm. latis, utrinque angustatis vel interdum 2–5 cm. supra basim subabrupte vel sensim angustioribus, apice acuminatis, acumine circiter 1 cm. longo, obtusiusculo, basi obtusis vel cuneatis, supra costa puberulis, subtus costa venisque hirtellis, novellis consperse minute hirtellis, nervis lateralibus utrinsecus 7–10, patenti-adscendentibus, supra impressis, subtus perspicuis, venis subclathratis vix prominulis, reticulo sub lente manifesto; petiolo 7–20 mm. longo, breviter hirtello; floribus ♂ ignotis; floribus ♀ solitariis (alabastris juvenilibus tantum visis), pedunculatis, dense tomentosus, bracteatis; pedunculo 1–1.5 cm. longo; bracteis ovatis vel triangularibus = 3 mm. longis, caducis; ovario depresso globoso; calyce urceolato 5- vel 6-dentato; corolla ut videtur 8-lobata; staminibus 8; stylo verisimiliter apice in 8 lobis stigmaticis diviso; fructibus depresso globosis, apice calycis tubo persistente coronatis, \pm 1.5 cm. diametro, dense tomentellis fere velutinis; pyrenis \pm 38, in fructu longitudinaliter secto ex apice ad basim 4 compacte superpositis.

SOLOMON ISLANDS: Ysabel: Meringe, *Brass* 3349, Dec. 1932, lowland rain-forest (slender small tree; leaves with pale nerves; fruit striate, very pale green); San Cristoval: Hinuahaoro, *Brass* 2885 (TYPE), Sept. 1932, alt. 800 m., rain-forest (small tree; flowers white; fruit green, 1.5 cm. diameter, striate).

Timonius solomonensis appears to be most like *T. laevigatus* Val. In the former wherever there are leaves there are also stipules, indicating a tendency for them to persist longer than usual; in Valeton's species the stipules have already fallen, also the adult leaves are glabrous and shortly petioled, while in ours the adult leaves are hirtellous on the midrib and main veins of the lower surface; again Valeton describes the pyrenes as few in the center of a fruit 2 cm. in diameter, a character hardly comparable to that in our species. Possibly if abundant material were available these differences might be bridged, but until that time we are regarding them as distinct species.

Timonius nitens sp. nov. FIG. 5, B.

Arbor usque 21 m. alta, gemmis et corollis aureo-sericeis, ceterum glabris; internodiis compressis griseis, 1–2 cm. longis; stipulis 1.5–4 cm. longis, basi 6 mm. latis, versus apicem sensim attenuatis, extus aureo-sericeis, intus glabris basi colleteribus confertis praeditis, cito caducis; foliis ellipticis vel oblanceolato-ellipticis, 6.5–13 cm. longis, 3–7 cm. latis, basi rotundatis vel subtruncatis, apice breviter et obtusissime acuminatis, acumine 5 mm. longo, 5–7 mm. lato, in sicco margine interdum undulatis, novellis margine aureo-pubescentibus, cito glabratis, maturis glabris, coriaceis, supra nitidulis, nervis lateralibus utrinsecus 8–10 utrinque prominulis, in axillis domatiiferis et interdum minute barbatis, domatiis minutis, reticulo irregulare, supra inconspicuo, subtus manifesto; petiolo 4–6 mm. longo, nigrescente; inflorescentiis ♂ immaturis tantum in axillis foliorum superiorum, floribus confertis (3 vel 4), pedunculis 5 mm. longis, calycis tubo campanulato, 3 mm. longo, intus pilosulo, extus sparsim pilosulo, margine leviter lobato, lobis usque 1 mm. longis; corolla extus sericea, tubo 4 mm. longo, lobis 4 mm. longis, oblongis; antheris in tubo medio insertis, 3 mm. longis; stylo 3 mm. longo; floribus ♀ singulis vel pedunculis trifloris; bracteis subnullis; pedunculo 1–1.5 cm. longo; ovario circiter 4 mm. longo, subgloboso, glabro; calycis tubo 2.5 mm. longo, extus consperse pilosulo, intus pilosulo, lobis

5 vel 6, usque 1.5 mm. longis obtusis; corollae tubo 6–7 mm. longo, extus aureo-sericeo, lobis 8, circiter 3 mm. longis, extus sericeis; staminibus 8 in tubo medio insertis; stylo 5 mm. longo, sparsim pilosulo, crasso (1–2 mm.), stigmaticis lobis 8, circiter 2–3 mm. longis; fructibus subglobosis, 1 cm. diametro, calyce persistente coronatis, longitudinaliter sulcatis et rugulosis; pyrenis numerosissimis, in fructu transverse secto 16–20, longitudinaliter ex apice ad basim 10 compacte superpositis.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, *Brass & Versteegh 10488, 10488A*, Oct. 1938, alt. \pm 2680 m., frequent in old secondary forest (tree 21 m. tall, 28 cm. diameter; bark smooth, soft brown; flowers white); same locality, *Brass 10994, 10995* (TYPE), Oct. 1938, alt. 2650 m., in secondary forest on old landslip (tree 12 to 15 m. high; leaves shining).

This species in leaf-outline and glabrousness is somewhat suggestive of *Timonius compressicaulis* (Miq.) Boerl. from Sumatra. It is readily distinguished by the shorter and fewer-flowered inflorescences and the more numerous pyrenes.



FIG. 5. A. *Timonius bracteatus* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. corolla, $\times \frac{1}{2}$, laid open; c. flower with corolla removed, $\times \frac{1}{2}$; d. cross-section of fruit, $\times \frac{1}{2}$. B. *Timonius nitens* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. infructescence, $\times \frac{1}{2}$; c. cross-section of fruit, $\times \frac{1}{2}$.

Another collection (*Brass 11748*, Balim River, Dec. 1938, alt. 1800 m.; tree 3–4 m. high scattered over open grassy slopes and common in sparse secondary forest) is an excellent match for this species except for the following characters: δ inflorescence profusely flowered, the calyx-lobes 2 mm. long, the corolla-tube about 8 mm. long, the lobes 3 mm. long. Whether these represent variations within a species we are not prepared to say. This is by far the best staminate collection of the group, but we preferred to describe matched material from the same locality, and apparently no similar pistillate material was collected from this locality.

Timonius imitans sp. nov. FIG. 6, B.

Arbor 23 m. alta; ramis atro-fuscis; internodiis 0.5–2 cm. longis, novellis compressis, internodio distali et alabastro terminali adpresse aureo-pubescentibus; stipulis 1–2 cm. longis, oblongo-lanceolatis, cito caducis; foliis 4–12 cm. longis, 2–5 cm. latis, lanceolatis vel anguste ellipticis, utrinque angustatis, apice acuminatis, acumine circiter 1 cm. longo, obtusiusculo, basi in petiolo 7–12 mm. longo angustatis, tenuiter coriaceis, utrinque glabris, nervis lateralibus utrinsecus 6–8 utrinque prominulis, oblique adscendentibus, venis et reticulo sub lente aequaliter manifestis, sub oculo inconspicuis; inflorescentiis ♂ axillaribus, ramosis, pedunculatis, pedunculo circiter 1 cm. longo, novellis aureo-puberulis cito corolla excepta glabris; floribus confertis, paucis (5–7); calyce subcampanulato, novello apice leviter angustato, demum ut videtur fisso quasi inaequaliter 5-lobato, intus pubescente; corolla in alabastro tantum visa, 8 mm. longa, lobis 4; antheris 4; stylo glabro; disco hinc alto; inflorescentiis ♀ trifloris; floribus non visis; fructibus immaturis fere glabris, globosis, circiter 8 mm. diametro, apice calyce persistente coronatis; pyrenis numerosissimis, in fructu transverse secto 16, longitudinaliter ex apice ad basim circiter 10 compacte superpositis.



FIG. 6. A. *Timonius decipiens* Merr. & Perry: habit, $\times \frac{1}{2}$. B. *Timonius imitans* Merr. & Perry: habit, $\times \frac{1}{2}$.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, Brass & Versteegh 12515 (TYPE), Feb. 1939, alt. 1500 m., frequent on forested slopes (tree 23 m. high, 40 cm. diameter; bark gray; fruits green).

Timonius imitans is most like *T. nitens*, described above. The leaves are different in outline, the former having a longer acuminate apex, and a longish cuneate base as if narrowed into the slender petiole; in the latter species the leaves are rounded or subtruncate at the base and have a short stout petiole. Both have similar terminal buds, but in *T. imitans* the distal node is pubescent also; in the other species, of which we have several collections, the distal node is glabrous. Unfortunately the staminate inflo-

rescences are not sufficiently developed in either for comparison; the fruits are very much alike.

Timonius decipiens sp. nov. FIG. 6, A.

Arbor parva; ramulis atro-cinereis; internodiis 0.7–3 cm. longis, novellis valde compressis, pubescentibus; stipulis 4–6 mm. longis, triangularibus, acuminatis, extus \pm pubescentibus, intus villosulis; foliis 7–13 cm. longis, 2.8–5.5 cm. latis, chartaceis, elliptico-lanceolatis vel oblongo-lanceolatis, apice breviter acuminatis, acumine 0.5–1 cm. longo, obtusiusculo, mucronato, basi anguste cuneatis, undique costa subtus sparsim adpresse pilosula excepta glabris, nervis lateralibus utrinsecus 8–10 oblique patentibus et arcuatis, supra manifestis, subtus vix prominulis in axillis barbellatis, venis et reticulo sub lente manifestis; petiolo 0.5–1.5 cm. longo, fere glabro; inflorescentiis non visis; fructibus pedunculatis, pedunculo 1.5–2 cm. longo, pubescente, minute et sparsim pubescentibus, depresso globosis, 1.2 cm. diametro, circiter 1 cm. longis, \pm 4-sulcatis, apice calyce persistente (tubo 1–1.5 mm. longo, lobis 4 circiter 1 mm. longis, triangularibus, acutiusculis, intus pubescentibus) extus sparsim pubescente coronatis; pyrenis 20–28, suboblique pendulis.

NORTHEAST NEW GUINEA: Yunzaing, *Clemens* 3984 (TYPE), Aug. 1936, alt. 1350 m., in forest (small tree with green fruit); Ogeramngang, *Clemens* 4502, alt. 1800 m., in forest.

Timonius decipiens is most like *T. flavescens* (Jack) Baker and *T. oblongus* Val. in general habit. The two last mentioned species have fruits with vertical pyrenes. In *T. flavescens* there is a very definite arrangement of the pyrenes within the pericarp, which is a distinguishing character. In *T. oblongus* the leaves are smaller and glabrous, but the main difference is in the number and arrangement of the pyrenes.

Timonius oblongus Val. Bot. Jahrb. 61: 49. 1927.

NETHERLANDS NEW GUINEA: 18 km. southwest of Bernhard Camp, Idenburg River, *Brass* 12497, Feb. 1939, alt. 2150 m., forest undergrowth of a gully (tree 2.5 m. high; unopened flowers red; fruit red, soft, depressed-globose, \pm 1.5 cm. diameter).

This specimen, although coming within the limits of the description of *Timonius oblongus* Val., differs from it in having red instead of white to golden-brown fruits. The flower-buds, although not yet open, are relatively large and approaching anthesis: peduncle 1.5–2 cm. long, very slender; bracts at the base of the ovary 2 mm. long, lance-linear, appressed-pilose; ovary about 2 mm. long, sparsely short-pilose; calyx-tube about the same length and 4-dentate, also appressed-pilose within; corolla (in bud) 11 mm. long, of which about 4 mm. belongs to the lobes, sparsely appressed-pubescent; anthers linear, 3 mm. long, attached about at the middle of the tube; style with 4 stigmatic lobes; a cross-section of the ovary shows 14 vertical "locelli" with an ovule in each.

Timonius bracteatus sp. nov. FIG. 5, A.

Arbor 8–11 m. alta; ramulis gracilibus, atro-brunnescentibus; internodiis 1–2 cm. longis, novellis valde compressis, adpresso-hirtellis cito glabratibus; stipulis 1.5–2.5 cm. longis, attenuato-acuminatis, extus praecipue in medio minute pubescentibus, intus medio glandulosis et subvillosis, margine utrinque glabris; foliis chartaceis, lanceolatis, 6–15 cm. longis, 2–5.5 cm.

latis, apice acutis vel breviter et obtuse acuminatis, basi cuneatis, novellis utrinque sericeis, maturis fere glabris vel subtus pilis brevibus adpressis sparsim indutis, nervis lateralibus utrinsecus 9–11 supra manifestis, subtus prominulis, reticulo subobscuro, cuticula utrinque inconspicue et minute striulata; petiolo 0.8–2 cm. longo, \pm adpresse pubescente; inflorescentiis pedunculatis, juvenilibus involucri late ovato acutato-clauso inclusis, δ trifloris, sericeo-villosulis; calycis tubo 5 mm. longo, lobis 4, oblongis, 5–6 mm. longis; corollae tubo 1.5 cm. longo, lobis 1 cm. longis, oblongis, obtusis; antheris 5 mm. longis, apice tantum exsertis; stylo circiter 10 mm. longo, pilosulo; floribus φ solitariis; pedunculo 2–3.5 cm. longo; calycis tubo 2 mm. longo, lobis \pm 5 mm. longis, oblongis; corollae tubo 1.5 cm. longo, lobis circiter 1 cm. longis; antheris in parte superiore tubi insertis, non exsertis, 5 mm. longis; stylo 1.5 cm. longo, pilosulo, gracili; stigmatibus 4, circiter 9 mm. longis, fere filamentosis; fructibus in sicco 2.5 cm. diametro, globosis, apice calycis lobis reflexis coronatis, adpresse pilosulis; sarcocarpio circiter 5 mm. crasso; pyrenis \pm 21, in medio fructu confertis, verticalibus.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 11982*, Jan. 1939, alt. 1790 m., occasional on slopes of primary forest (tree 11 m. tall, 39 cm. diameter; bark 2 mm. thick, brown, shallowly fissured; flowers white); same locality, *Brass 12234* (TYPE), Jan. 1939, alt. 1700 m., rain-forest of ravines (substage tree 8 m. high; flowers cream-colored, fleshy; fruit hard, green, to 3 cm. diameter).

Although *Timonius bracteatus* looks like a very distinct species, from descriptions alone it is somewhat difficult to decide what species with vertical pyrenes may be most nearly related. *Timonius laevigatus* Val. has a fruit similar in size but lacks the long calyx-lobes characteristic of our species; there are also foliar differences. The vegetative characters suggest *T. subcoriaceus* Val., but the arrangement of the pyrenes immediately removes the species from that alliance.

Timonius xanthocarpus sp. nov. FIG. 7, B.

Arbor 4 m. alta; ramulis tomentosis; internodiis 1.5–2 cm. longis, ultimis compressis; stipulis circiter 1.3–1.7 cm. longis, lanceolatis, acuminatis, extus aureo-tomentosis, intus adpresse villosis, caducis; foliis ellipticis, 5.5–16 cm. longis, 2–6.5 cm. latis, utrinque angustatis, basi cuneato-obtusis, apice breviter acuminatis interdum mucronatis, valde coriaceis, supra glabris, costa nervisque hirtellis, subtus consperse hirtellis, costa nervisque breviter patenti-hirsutis vel hirtellis; nervis lateralibus utrinsecus 9–14 supra impressis, subtus prominentibus, venis interdum clathratis, irregulariter positis, supra impressis, subtus prominulis; petiolo 7–10 mm. longo, tomentuloso; floribus δ non visis; floribus φ solitariis, pedunculatis, bracteatis, axillaribus, pedunculo 1–1.5 cm. longo, hirtello vel tomentuloso; bracteis 5–6 mm. longis, linearibus, hirtellis; ovario globoso, 4 mm. diametro, hirtello; calyce dense hirtello, tubo 2 mm. longo, lobis 4, 7–10 mm. longis, lineari-subulatis; corolla adpresse villosula, tubo 1 cm. longo, lobis linearibus, circiter 10 mm. longis; antheris 4 mm. longis, dorso setuloso, in tubo medio insertis; stylo 8 mm. longo, hirtello, stigmatibus 4 terminato; fructibus ellipsoideis, immaturis, 1.5 cm. longis, 1.2 cm. latis, calycis lobis coronatis, hirtellis, obtuse 4-angulatis; pyrenis \pm 20 verticalibus.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, *Brass 12226* (TYPE), Jan. 1939, alt. 1750 m., open places in forest, not common (tree 4 m.

high; leaf-nerves deeply impressed above, prominent beneath; flower yellow; fruit immature, 4-ridged).

Timonius xanthocarpus should be compared with *T. Klossii* Wernham. From the description it seems to differ in the following points: *T. Klossii* has chartaceous leaves with a subacute apex and petiole scarcely 2 cm. long, and the stipules are sericeous toward the margin, otherwise glabrous. Wernham does not say whether the anthers are glabrous, or as in our species setulose on the back; this character ought to be the same whether in ♂ or in ♀ flowers. The pyrenes are cruciately arranged, as in *T. flavescens* (Jack) Baker, in the angles or lobes of the fruits, not in the center as described for *T. villosus* Val. from New Guinea. *Timonius xanthocarpus* is well marked by the coriaceous leaves with prominent venation, the yellow pubescence of the younger parts, the flowers, and the fruits, and the fairly large flowers with linear bracts at the base and with linear calyx-lobes; the hairs on the back of the anthers are not a common character in the species which we have examined.



FIG. 7. A. *Timonius strumarius* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. part of branch, $\times \frac{1}{2}$, showing stipules; c. ♂ inflorescence, $\times \frac{1}{2}$; d. corolla, $\times 1$, laid open; e. stamens, enlarged; f. cross-section of fruit, $\times \frac{1}{2}$. B. *Timonius xanthocarpus* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. flower, $\times \frac{1}{2}$; c. fruit, $\times \frac{1}{2}$; d. cross-section of fruit, $\times \frac{1}{2}$.

Timonius strumarius sp. nov. FIG. 7, A.

Arbor parva; ramulis teretibus brunnescentibus; internodiis novellis compressis, \pm sericeo-hirtellis, saepe sulcatis; stipulis 1-1.3 cm. longis, basi 5 mm. latis, acuminatis vel acutis. extus medio sericeo-hirtellis, intus medio adpresso villosulis et glandulosi, margine utrinque fere glabris. caducis; foliis ellipticis vel leviter obovato-ellipticis, 9-15 cm. longis, 4-6.5 cm. latis, apice subabrupte et breviter acuminatis, acumine usque 5 mm. longo, vel acutis, basi cuneatis, chartaceis, novellis utrinque dense adpresso-pilosis, cito glabratis, maturis supra brunnescentibus, fere glabris, subtus pallide olivaceis, sparsim (costa nervisque densius) pilosis; nervis lateralibus utrinsecus 8-11 oblique patentibus, venis inconspicuis; petiolo 0.7-1.8 cm.

longo. \pm piloso; inflorescentiis δ axillaribus pedunculatis, interdum ramosis, bracteatis, floribus sericeis, confertis, pedunculo 0.7–2 cm. longo, sericeo; calycis tubo 3 mm. longo, lobis 4–5 mm. longis, 1 mm. latis, corollae tubo 11 mm. longo (prope anthesin), lobis 5, circiter 4.5 mm. longis; antheris supra basin tubi 7 mm. insertis, dorso sparsim setuloso; stylo 6 mm. longo, pubescente; floribus η solitariis axillaribus, pedunculatis, bracteatis, sericeis; pedunculo 5–8 mm. longo; calycis tubo 1 mm. longo, lobis 3–4 mm. longis, 1–2 mm. latis; corolla 4- vel 5-lobata (alabastro tantum viso); staminibus in tubo medio insertis, antheris dorso setulosis; stylo hirtello, stigmatibus 4 (et uno brevior) terminato; fructibus depresso-globosis, 13 mm. diametro, fere glabris, calycis lobis reflexis et disco protruberante coronatis; pyrenis verticalibus 12–14, valde lignosis.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *Brass* 7742, Sept. 1936, common substage tree in inferior rain-forest (bark thin, suberose; leaf-nerves deeply impressed above, prominent below; flowers white); Gaima, Lower Fly River (east bank), *Brass* 8293 (TYPE), November 1936, edge of sago swamp in rain-forest (small tree 3 m. tall; leaf-nerves impressed above, prominent beneath; fruit up to 1.8 cm. diameter); same locality, *Brass* 8338, common in rain-forest and savanna-forest contact-zone (tree 5–6 m. high; bark brown, fibrous-flaky; flowers cream-colored).

This species is very close to *Timonius Branderhorstii* Val. We have separated the two on account of the differences in the fruit. In the plate of Valetton's species the lobes are longer and narrower than in the Brass collections and not at all strongly reflexed, nor is there any indication of the protrusion of the disk, a character well marked in the material before us. The fruit of Valetton's species is described as densely sericeous, but in our species only the young fruits of the type-collection are sericeous; in the more mature fruits most of the pubescence has disappeared except for a remnant on the calyx and disk.

Timonius bougainvillensis sp. nov. FIG. 8, B.

Arbor usque 15 m. alta; ramulis fuscis, gracilibus, internodiis 1–3 cm. longis, novellis glabris vel consperse hirtellis; stipulis 1.5–3.5 cm. longis, longe acuminatis, glabris, cito caducis; foliis oblongo-lanceolatis, 3.5–9.5 cm. longis, 1.6–3 cm. latis, basi obtusis vel obtuse cuneatis, apice acuminatis et interdum mucronatis, utrinque glabris vel subtus costa sparsim hirtellis, valde chartaceis, nervis lateralibus utrinsecus 7–10 patentibus adscendentibus arcuatis, supra manifestis, subtus prominulis, reticulo inconspicuo, cuticula supra manifeste vel inconspicue lineato-striulata, subtus levi; petiolo 1–1.3 cm. longo, fusco; inflorescentiis δ non visis; floribus η solitariis vel interdum cymosis; pedunculo 7–11 mm. longo, glabro; bracteis subnullis; calyce tubulato, truncato, 2 mm. longo, glabro; corolla lobis extus sparsim pubescentibus exceptis glabra, in alabastro juvenili 8 mm. longa, lobis 6; staminibus 6; stylo brevi stigmatibus 12 terminato serie duplici superpositis, 6 quam reliquis longioribus; fructibus glabris, in sicco \pm 6 mm. diametro, apice calycis tubo coronatis; pyrenis in fructu longitudinaliter secto ex apice ad basin 8–9 compacte superpositis.

SOLOMON ISLANDS: Bougainville: Kupei Gold Field, *Kajewski* 1677 (TYPE), 1750, April 1930, alt. 900 m., rain-forest (trees up to 15 m. high; flowers white; fruit globular with a tubular end, 9 mm. long, 11 mm. diameter); Koniguru, Buin, *Kajewski* 2049, Aug. 1930, alt. 1000 m., rain-forest (epiphytic tree; flower white; fruit 7 mm. long, 1 cm. diameter).

This species tends to be almost entirely glabrous; the flower looks somewhat like that of *Timonius avenis* Val. except that the bud is shorter and stouter than in the latter species. The only pubescence that appears on the flower is at the apex of the bud, apparently on the corolla-lobes; the truncate calyx is not quite so short as in the New Guinean species; and of course the leaves with their definite venation at once set it apart as distinct. It may be allied to *T. appendiculatus* Merr., from the Philippines, but that species lacks the distinctly acuminate apex of the leaf.



FIG. 8. A. *Timonius novo-guineensis* Warb.: a. habit, $\times \frac{1}{2}$; b. ♀ inflorescence (young), $\times \frac{1}{2}$; c. infructescence, $\times \frac{1}{2}$. B. *Timonius bougainvillensis* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. fruit, $\times \frac{1}{2}$; c. longitudinal section of fruit, $\times \frac{1}{2}$.

Timonius Versteegii Val. Bull. Dép. Agr. Ind. Néerl. 26: 39. 1909, Nova Guin. Bot. 8: 475. 1911.

BRITISH NEW GUINEA: Palmer River, 2 miles below junction Black River, Brass 7026, June 1936, alt. 100 m., rain-forest undergrowth (small tree 3 m. tall; leaves flat, pale below; fruit large, red, costate, ovoid-globose, \pm 4 cm. long and 3.5 cm. diameter, solitary in axils).

There can be scarcely any doubt that this is the species previously reported from Netherlands New Guinea. The only variation we see from the description is in the slightly more slender calyx-lobes crowning the fruit (lobes 2.5 cm. \times 3 mm.); the peduncle supporting it is 6 mm. long; the fruit contains about 19 pyrenes vertically arranged.

Timonius Roemerii Val. Nova Guin. Bot. 8: 476. 1911.

NETHERLANDS NEW GUINEA: Nabire, Kanehira & Hatusima 11515, Feb. 1940, on the edge of high rain-forest (plant 5 m. high; fruit white).

This specimen has only a fruit and two leaves with stipules at the apex of the stem. The bracts are 4 cm. long, appressed-pilose within, and the upper margin is frayed and broken; they do not entirely cover the fruit. The latter is globose, 4 cm. in diameter, crowned by 8 strongly reflexed

calyx-lobes about 2 cm. long; the pyrenes are obliquely arranged in series; outside of the pyrenes the epicarp is about 5 mm. thick.

Timonius rivularis sp. nov. FIG. 9, A.

Arbor usque 16 m. alta: ramulis sulcatis, glabris, internodiis 0.7–2.5 cm. longis; stipulis 2–4 cm. longis, sensim attenuatis, extus sericeo-pilosis, cito caducis; foliis lanceolatis, 11–18 cm. longis, 3–5 cm. latis, basi et apice acuminatis, chartaceis, supra glabris vel utrinque consperse (subtus costa et venis densius) adpresse pilosis, nervis lateralibus in axillis barbellatis, utrinsecus 12 vel 13 supra manifestis, subtus prominulis, adscendentibus, reticulo supra inconspicuo, subtus sub lente distincto, in areolis parallelo-lineatis; petiolo 1–2 cm. longo, sparsim piloso, cito glabrato; inflorescentiis ♂ tantum visis, 2–5 (–7)-floris, axillaribus, pedunculatis, pedunculo 2–2.5 cm. longo, glabro, semel dichotomis, ramis 1–1.5 cm. longis, adscendentibus, floribus sessilibus; calyce tubulato, 7 mm. longo, extus consperse intus densius pubescente; corollae tubo sericeo, 1.5 cm. longo, lobis 5, oblongis, 7 mm. longis, extus sericeis; staminibus 5 in parte superiore tubi insertis, 6 mm. longis, inclusis; stylo 6 mm. longo, glabro.

BRITISH NEW GUINEA: Palmer River, 2 miles below junction Black River, Brass 7252 (TYPE), July 1936, alt. 100 m., plentiful in older seral forests on the sandy river-banks (tree attaining 15–16 m.; leaves thin, flat, with conspicuous lateral nerves; flowers white).



FIG. 9. A. *Timonius rivularis* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. enlarged portion of leaf showing detail of venation. B. *Timonius melanophloeus* Merr. & Perry: habit, $\times \frac{1}{2}$.

None of the species described, except *Timonius Timon* (Spreng.) Merr. (which has definite calyx-lobes), seems to be greatly like this collection. It is readily distinguished by the truncate and almost glabrous calyx, the long slender leaves with fairly numerous ascending nerves, and the very fine hairs which appear on the younger parts, but mostly soon disappear. The venation of the lower leaf-surface shows a definite pattern.

Timonius melanophloeus sp. nov. FIG. 9, B.

Frutex 1 m. altus; caulibus pluribus, teretibus, atro-purpureis; ramulis

fuscis adpresse pubescentibus, internodiis 1–3.5 cm. longis, novellis compressis; stipulis 4 mm. longis, ovatis, acutis vel acuminatis, extus sericeis, intus villosulis; foliis 4–8 cm. longis, 1–2.5 cm. latis, lanceolatis, basi rotundato-cuneatis, apice sensim longe acuminatis, coriaceis, supra costa puberula excepta glabris, subtus consperse puberulis, costa densius pubescente, nervis lateralibus utrinsecus 7–9 utrinque aequaliter manifestis, patenti-adscendentibus et arcuatis, reticulo utrinque manifesto; petiolo 3–5 mm. longo, pubescente; inflorescentiis ♂ tantum visis, pedunculatis, pedunculo 1.5–3 cm. longo, \pm puberulo, trifloris; floribus sericeis, medio sessile, lateralibus pedicellatis, pedicello 3 mm. longo; calycis tubo 1 mm. longo, lobis 4, ovatis, 1 mm. longis; corollae tubo 8 mm. longo, 1 mm. diametro, lobis 3 mm. longis, 4, oblongis; staminibus 3.5 mm. longis in parte superiore tubi insertis; stylo glabro brevi.

SOLOMON ISLANDS: Ysabel: Cape Prieto, *Brass* 3475 (TYPE), Jan. 1933, alt. 200 m., open sun-parched slopes, common (shrub or bush 1 m. high; stems several from a thick woody base; bark dark purple; flowers cream-colored).

Perhaps the species is to be related to *Timonius subsessilis* Val. of Netherlands New Guinea, but the latter has larger and entirely glabrous leaves. This collection seems to be best characterized by the very dark bark of the branchlets, which tend to have a cinereous appearance on account of the very fine pubescence covering them; the stipules are usually present on the last two nodes; the flowers are very slender, and the leaves are fairly small as well as conspicuously acuminate.

Timonius densiflorus Val. Bot. Jahrb. 61: 39. 1927.

BRITISH NEW GUINEA: Iaritari, *Brass* 707, November 1925, alt. 450 m., foothill-forest stream (small compact tree about 4.5 m. tall, with green fruit).

Vegetatively this collection agrees very well with that of an isotype of *Timonius densiflorus* Val. This is the ♀ plant with infructescences pedunculate (peduncles about 1.5 cm. long) and once or twice dichotomous in the upper axils; fruits globose, \pm 6 mm. in diameter, crowned by the remnants of the calyx-lobes; pyrenes in about 16 rows, obliquely pendulous from the apex of the fruit.

Timonius kaniensis Val. Bot. Jahrb. 61: 42. 1927. FIG. 10.

NETHERLANDS NEW GUINEA: Hollandia, *Brass* 8842, June 1938, alt. 50 m., rain-forest substage (tree 15 m. tall; leaf-nerves prominent beneath); Bernhard Camp, Idenburg River, *Brass* 13894, April 1939, alt. 120 m., rain-forest of lower mountain-slopes (subsidiary tree 15 m. high; flowers white).

After preparing a description for these collections we have decided that they fall too near *Timonius kaniensis* Val. to be kept separate, at least until one has an opportunity to examine an isotype, if one should be extant. The shape of the leaves is more like that given for *T. latifolius* Lauterb. & K. Schum., where the leaves are somewhat abruptly narrowed toward the base and truncate or subcordate at the very base; however, they are about the same size as those described for *T. kaniensis* Val. Furthermore, the inflorescence is bracteate, on a short peduncle, and has very short branches. Our specimens are not in similar stages for comparison, the type being a ♀ plant with young flower-buds. *Brass* 8842 is a ♀ plant with fruit and one dried corolla attached, and the other collection is a ♂ plant with the inflo-

rescences mostly in young bud. We add the following data from the material at hand: ♀ inflorescence twice dichotomous; corolla outside appressed-sericeous, the tube 6 mm. long, the lobes 7, oblong, about 4 mm. long; anthers inserted near the middle of the tube; style 6–7 mm. long, pubescent; stigmas partly broken; fruit hirsute, depressed-globose, about 9 mm. diameter, crowned by 4 or 5 calyx-lobes which are about 5 mm. long; the pyrenes are numerous, obliquely pendulous; in a median longitudinal section of the fruit on either side are \pm 6 pyrenes compactly superposed from the apex to the base of the fruit. The staminate inflorescence is branched but the branches are short and the flowers crowded, the same tomentulose or somewhat hirtellous pubescence is present on the outside of the bracts and flowers as in the ♀ inflorescence. The bracts are oblong-ovate or ovate, 4–6 mm. long, and subtend the branches as well as each individual flower; calyx-tube 1.5–2 mm. long, the lobes 4, ovate, acutish, 1.5–2 mm. long; corolla-tube 4.5 mm. long, the lobes 4, oblong, 2.5 mm. long, the anthers



FIG. 10. *Timonius kaniensis* Val.: a. habit, $\times \frac{1}{2}$; b. portion of branch showing ♂ inflorescence, $\times \frac{1}{2}$.

3 mm. long, the apex barely exerted; style short, pubescent. Most of the flowers are in young bud. The ♂ inflorescence very closely resembles that of *T. oblanceolatus* Val., but in the latter the bracts are more quickly deciduous, and the pubescence is of appressed short stiffish hairs rather than spreading in all directions as in our collections. The base of the leaf is different too, but this holds only as to the specimens cited, not as to the two descriptions. We are fortunate to have at hand an isotype of *T. oblanceolatus* Val.

Timonius novo-guineensis Warb. Bot. Jahrb. 13: 434. 1891; Schumann & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 567. 1900; Val. Bot. Jahrb. 61: 47. 1927. FIG. 8, A.

NETHERLANDS NEW GUINEA: Hollandia, Brass 8896, 8897, June 1938, alt. 10–20 m., in seral shrubberies, plentiful in gravel-beds of river (shrub usually with several stems, erect to 2.5–3 m.; leaves smooth and shining; flower-buds white).

The flowers of both staminate and pistillate plants are immature, as are also the fruits. In the collections cited the leaves are not so definitely acuminate as in the isotype, and they are somewhat more coriaceous; the plants also are not quite so pubescent, but these are all minor differences and are noted here to indicate the variation.

Timonius jobiensis Wernh. Jour. Bot. 56: 131. 1918.

NETHERLANDS NEW GUINEA: Roemberpon Island, 60 miles south of Manoekwari, *Kanehira & Hatusima* 13299, March 1940, in rocky strand-forest (plant 3 m. tall; flower white).

The type was collected on the island of Japen (Jobi). Previously known only from the type collection.

Mastixiodendron Melchior

In Jour. Arnold Arb. 23: 416. 1942, we called attention to the fact that *Mastixiodendron* Melchior belongs to the Rubiaceae rather than to the Cornaceae. Not long ago we were checking Blumea for some other information, and a paragraph on the genus *Mastixiodendron* caught our eye. At once we realized that here was an overlooked item. Danser, in his monograph of the Cornaceae of the Netherlands Indies (Blumea 1: 69. 1934), apparently anticipating the occurrence of the genus in that region, had already pointed out that *Mastixiodendron* belongs not to the Cornaceae but to the Rubiaceae. He suggested that Melchior had been misled by the choripetalous corolla and then said that he had been unable to ascertain to his satisfaction whether the corolla was choripetalous or not. In the material of two species which we have at hand the corolla-lobes are thick and stiff, the bud is practically square at the base, and in the open flowers of these the petals appear to be separate. In the third species, which has oblong buds, the petals are obviously separate to the base. *Mastixiodendron* has now been found in Halmahera, all three parts of New Guinea, the adjacent island of Japen, Banika in the Russell group of islands in the Solomon Islands, and in Fiji (see A. C. Smith in Jour. Arnold Arb. 26: 108-110. 1945).

Mastixiodendron Stoddardii sp. nov.

Verisimiliter arbor; cortice griseo-brunnescente longitudinaliter ruguloso; ramis teretibus, novellis compressis, glabris; foliis ellipticis, 12.5-17 cm. longis, 5-7 cm. latis, chartaceis vel tenuiter coriaceis, utrinque angustatis, apice obtusiusculis vel brevissime et obtuse acuminatis, basi cuneatis et in petiolum breviter decurrentibus, in sicco fuscis vel olivaceis plerumque subtus pallidioribus, glabris, costa supra interdum anguste canaliculata, subtus prominente, nervis lateralibus utrinsecus \pm 17 utrinque prominulis patentibus prope marginem anastomosantibus, reticulo venularum utrinque manifesto; petiolo 2-3 cm. longo; stipulis oblongo-lanceolatis, 1.3-2 cm. longis, cito caducis; inflorescentiis in axillis foliorum summorum dispositis, 9 cm. longis, cymo-paniculatis; pedunculo et ramis glabris, pedunculo \pm 4 cm., ramis circiter 2.5 cm. (summis 1 cm.) longis; pedicellis 3 mm. longis, minute puberulis vel glabris; bracteis minutis cito caducis; alabastro ovoideo, 4-angulato; calycis lobis 4, circiter 1 mm. longis, triangularibus, acutis; petalis 4, in sicco 4 mm. longis, 2.5 mm. latis, ovatis, obtusiusculis,

extus glabris, intus dense pubescentibus, pilis longis crassiusculis, crispule intertextis; staminibus 2 mm. longis, 4. filamentis apicem versus leviter attenuatis; ovario 1–1.5 mm. longo, depresso, obtuse 4-angularato, stylo 1 mm. longo.

SOLOMON ISLANDS: Russell group: Banika, *Stoddard 12* (TYPE) (received at A. A. Aug. 1944). Three collections from NETHERLANDS NEW GUINEA (Bernhard Camp, Idenburg River, *Brass & Versteegh 13563*, alt. 225 m., and 2 km. southwest of Bernhard Camp, *Brass & Versteegh 13502*, alt. 800 m., rain-forest; Japen Island, *Neth. Ind. For. Serv. bb.30355*) are either conspecific or closely related.

The New Guinean material differs from the Banika Island collection in having stiffer leaves, with a more definitely marked obtuse acumen, and a more obviously reticulate upper surface. The latter may be due to an inherent difference in the plants or it may possibly be owing to different methods of drying. None of the New Guinean material is sufficiently advanced in the flowering stage to show anything of the inflorescence. The fruits on the specimens are abnormal because of insect damage, but they show a fairly definite pattern in cross-section: there is much less fibrous tissue in the pericarp of these than in the fruits of *Mastixiodendron Smithii* described below, and more cancellate tissue; the apex of the fruit is at most convex, not prominently protruding as in the other New Guinean species. The flower of *M. Stoddardii* is very like that of *M. pachycladon* (K. Schum.) Melch., but the former is readily distinguished by its smaller and obtusely acuminate leaves. It somewhat resembles the Fijian material (here again the leaves are obtuse), but the latter is readily distinguished by the papillate rather than pubescent upper surface of the petals.

Named for the collector, Lieut. C. H. Stoddard of the U. S. Navy.

Mastixiodendron Smithii sp. nov.

Arbor 20 m. et ultra; cortice brunnescente vel cinereo, longitudinaliter ruguloso; ramis teretibus, novellis valde compressis, glabris; foliis ellipticis vel leviter obovatis, 9–21 cm. longis, 4.5–10 cm. latis, supra medium latissimis, apice breviter et obtuse acuminatis, acumine 3–5 mm. longo, basi elongato-cuneatis, in sicco brunnescentibus vel subtus olivaceis, glabris, subnitidulis, costa supra plana, subtus prominente, nervis lateralibus utrinsecus 10–14 utrinque prominulis prope marginem anastomosantibus, venulis manifestis non prominulis; petiolo 2–3 cm. longo; stipulis 1.5–2.5 cm. longis, oblongo-lanceolatis, cito caducis; inflorescentiis in axillis foliorum summorum dispositis, \pm 13 cm. longis latisque, paniculatis; ramis valde divaricatis, infimis 3 cm. longis, pedunculo 4 cm. longo, pedicellis 3–4 mm. longis; bracteis minutis, caducis; alabastro oblongo, 7 mm. longo; ovario et calyce vix 3 mm. longo, glabro, calyce 4-dentato, dentibus triangularibus vix 1 mm. longis, acutis; petalis 4 liberis, 5 mm. longis, extus puberulis, intus fere basim pilosis, prope medium pilis longioribus; staminibus 4 mm. longis; disco 1.5 mm. longo, minute puberulo; stylo 2 mm. longo, glabro; fructibus ellipsoideis, 4–4.5 cm. longis, 2 cm. diametro, apice disco coronatis, 2-locularibus; pericarpio fibroso hinc inde cancellato.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 12517*, Feb. 1939, alt. 1200 m., occasional in primary forest (tree 32 m. tall, 61 cm. diameter; bark black, fairly smooth; wood yellow; fruit green). NORTHEAST NEW GUINEA: Yunzaing, *Clemens 3723*, July 1936, alt. about 1500 m.,

hill in forest (tree 19–22 m. tall; fruit gray-green); Ogeramnang, *Clemens* 5154 (TYPE), Jan. 1937, alt. about 1750 m.

Named for Dr. A. C. Smith, because of his special interest in and work on this genus.

The fruit of this species differs from that of *Mastixiodendron pachycladon* (K. Schum.) Melch. in that it is very much larger and has a much thicker and fibrous pericarp with here and there what appears to be aëri-ferous tissue. The fruit is more or less pointed at both ends rather than rounded as in Melchior's species. Then too the leaves have a very short obtuse acumen, whereas in *M. pachycladon* the leaves are broadly rounded at the apex. *Mastixiodendron Stoddardii* Merr. & Perry may be readily distinguished by the smaller leaves, the ovoid rather than oblong flower-buds, and the smaller fruits, but it is to be noted that in the New Guinean material of that species, or a closely allied one, the fruits also have a pericarp with cancellate tissue.

Coffea Linnaeus

With no good material of *Coffea* (*Lachnostoma*) in our herbaria for study or comparison, and with three species described from New Guinea transferred to some other genus or left in an uncertain position, we hesitate even to try to name the material at hand. Temporarily we are disposing of it thus:

Coffea apoda (Val.) Bremekamp, Bull. Jard. Bot. Buitenz. III. 16: 276. 1940; vel aff. *Ixora apoda* Val. Ic. Bogor. 4: t. 341. 1912.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, *Brass* 12821, 13026, Feb. 1939, alt. 1200 and 1250 m., rain-forest undergrowth, rare (shrub 1 m. high; calyx-lobes red; corolla white).

Described from Obi Island; the New Guinean collections, if not identical, are too close to be separated without material for comparison.

Coffea (*Lachnostoma*) ?

BRITISH NEW GUINEA: Baroka, Makeo District, *Brass* 3743, April 1933, alt. 30 m., brushy rain-forest (abundant shrub of somewhat scandent habit; foliage dull green; fruit immature); Rouna, *Carr* 12389, May 1935, alt. about 450 m., brink of stream in very steep hill-forest (tree about 1.8 m. tall; fruit black-purple); Kanosia, *Carr* 11220, Feb. 1935, alt. about 15 m., secondary forest (tree about 2 m. tall).

In this material the fruit seems to be terminal on short lateral branches. There is a strong resemblance to the plate of *Coffea madurensis* Teysm. & Binn. in *Teysmannia* 11: 31. 1900. The general habit suggests *C. bengalensis* Roxb., and strangely enough we found the latter species recorded from Sunday Island [Torres Strait]. We believe the whole group is in need of detailed and careful study.

Ixora Linnaeus

With the aid of Bremekamp's excellent work on the genus *Ixora* Linn., we have placed our unnamed collections with considerable ease. We note here two new species and the extension of the range of *I. Kerstingii* Lauterb. & K. Schum. from Northeast and Netherlands New Guinea into British New Guinea.

Ixora Kerstingii Lauterb. & K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 571. 1900; Brem. Bull. Jard. Bot. Buitenz. III. 14: 305. 1937.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, *Brass* 13830, Apr. 1939, alt. 150 m.; rain-forest of lower mountain-slopes (undergrowth tree 3 m. high; flowers white). BRITISH NEW GUINEA: Kubuna, *Brass* 5623, Nov. 1933, alt. 100 m., rare in rain-forest undergrowth (bush about 2 m. tall; pendent panicles with pale yellow flowers).

Ixora cordata sp. nov.

Arbor 4-6 m. alta; ramis brunnescentibus, teretibus vel compressis, internodiis 3-8 cm. longis; petiolo 3-5 mm. longo, crassiusculo; foliis chartaceis vel tenuiter coriaceis, oblongo-lanceolatis, 12.5-19 cm. longis, 4.5-6.5 cm. latis, apice acutis vel acuminatis, basi cordatis, nervis lateralibus utrinsecus 9-11 utrinque prominulis, venulis utrinque manifestis, reticulo laxo supra manifesto, subtus inconspicue manifesto; stipulis brevibus, ovatis, arista quam vagina brevioribus munitis, intus parte inferiore pilosis; inflorescentiis terminalibus, multifloris; axi, ramis et pedicellis puberulis; pedunculo 4-7 cm. longo; axi inflorescentiae \pm 10 cm. longo, internodio infimo 3-6 cm. longo; ramis infimis oppositis, circiter 7 cm. longis, divaricatis; pedicellis 2-4 mm. longis; bracteis infimis anguste lanceolatis, 5 mm. longis; bracteolis filiformibus inconspicuis; ovario et calyce 2 mm. longo; calyce minute lobato; corollae tubo 8 mm. longo, fauce glabro, lobis 6-7 mm. longis, 3 mm. latis, obtusiusculis; filamentis 2 mm. longis, antheris 5 mm. longis, mucronatis; stylo 10 mm. longo secus medium sparsim piloso; stigmatibus 3 mm. longis; fructibus depresso globosis, 7 mm. longis, 9 mm. diametro.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, *Brass* 12860 (TYPE), Feb. 1939, alt. 1200 m., common on rain-forest slopes (tree 4-6 m. high; flowers pink; peduncles and pedicels red; fruit red); 2 km. southwest of Bernhard Camp, Idenburg River, *Brass* 13613, Mar. 1939, alt. 700 m., common in rain-forest undergrowth (tree 4-5 m. high; fruit red).

In general aspect this species resembles *Ixora amplexifolia* K. Schum. & Lauterb., but there are several differences. The reduced leaves near the base of the peduncle are lacking; even in fruit the ultimate branchlets and pedicels are puberulent or minutely spreading-pubescent; the flowers are smaller and more numerous at the apices of the branches than in the specimens we have of the earlier species; and also the lobes of the calyx are scarcely at all marked in our species, but perfectly obvious in the related one. The leaves in the second specimen cited are a little larger (23-34 \times 6-10 cm.) than in the type collection and more deeply cordate; the fruit is smaller (fruiting specimen only), but in neither is the fruit ripe.

Ixora ensifolia sp. nov.

Frutex 1 m. altus, pauciramosus; ramis gracilibus circiter 1.5 mm. diametro, cortice griseo vel pallide brunneo; foliis sessilibus (petiolo vix 1 mm. longo), chartaceis, linearibus vel subensiformibus, 20-31 cm. longis, 1.2-1.5 cm. latis, apice sensim angustatis, acuminatis, basi auriculatis, supra subnitidulis, nervis lateralibus supra prominulis utrinsecus \pm 35, tamen sicut venulis laxo reticulatis (subtus tantum manifestis) supra prominulis; stipulis 5-10 mm. longis, ovatis et longe aristatis, axilla pilosis; inflorescentiis pendentibus terminalibus, laxo paniculatis, e floribus \pm 25 compositis; pedunculo \pm 16 cm. longo, 2 mm. supra basim bracteis 9 mm. longis vel foliis rudimentariis munito; axi inflorescentiae ad minimum 15 cm. longo,

ramis infimis \pm 12 cm. longis, oppositis, divaricatis, superioribus brevioribus et plerumque suboppositis; pedicellis \pm 1.5 cm. longis; bracteis lanceolatis 2–2.5 mm. longis; bracteolis vix 1 mm. longis, ab ovario remotis; ovario 1.5 mm. longo, glabro; calyce vix 1 mm. longo, lobis late ovatis; corollae tubo 4 mm. longo, fauce glabro; lobis 9 mm. longis, 1.5 mm. latis, acutis; filamentis 2 mm. longis, antheris 8 mm. longis, aristatis, basi profunde fissis; stylo (parte inclusa pilosa 1 mm. supra basim excepta) 7 mm. longo, stigmatibus 2 mm. longis.

BRITISH NEW GUINEA: Dieni, Ononge Road, *Brass 3941* (TYPE), May 1933, alt. 500 m., common in rain-forest (shrub about 1 m. high with a few slender spreading branches; panicles pendent; petals green in bud; peduncle and pedicels reddish).

The plant appears to belong to *Ixora* sect. *Macropus* Brem. and is related to *I. leptopus* Brem., if we have correctly interpreted the latter species. Both seem to have the same type of inflorescence. The species is readily distinguished by the long slender auriculate subensiform sessile leaves and the very open inflorescence.

Versteegia Valetton

Versteegia aff. *cauliflora* (Lauterb. & K. Schum.) Val. Nova Guin. Bot. 8: 484. 1911, in nota.

Psychotria cauliflora Lauterb. & K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 574. 1900.

BRITISH NEW GUINEA: Palmer River, 2 miles below junction Black River, *Brass 7065*, June 1936, alt. 100 m., ridge-forest undergrowth (small tree 4 m. high, with soft glabrous leaves; fruit red, compressed-globose, 4 cm. diameter, solitary on trunk below the branches).

This genus as known at present consists of two described species and a third very briefly set forth in a key. The present collection has leaves with longer petioles and depressed-globose fruits in contrast to the short petioles and ovoid fruits of *Versteegia cauliflora* (Lauterb. & K. Schum.) Val. However, since we have only a single specimen with a single fruit, it seems unwise to try to carry the determination further.

Coprosma J. R. & G. Forster

Even with the aid of Oliver's recent monograph on the genus *Coprosma* we have found it difficult to dispose satisfactorily of the collections at hand. With flowers so much alike, the question of distinguishing intrinsic characters from differences brought about by variation in habitat has constantly bothered us. However, for purposes of distribution we have assigned the species as best we can, leaving their ultimate disposition for the specialist. The following key will show at a glance what we have taken to be good characters:

Corolla tubular; flowers solitary, terminal; plant prostrate.....*C. Archboldiana*.

Corolla campanulate; flowers solitary or clustered; upright shrubs.

Leaves obtuse.....*C. divergens*.

Leaves acute or cuspidate.

Branches and stipules entirely glabrous.

Leaves mostly ternate, glabrous.....*C. papuensis*.

Leaves opposite, the midrib beneath sparsely hirtellous.....*C. Wollastonii*.

- Branchlets pubescent; stipules pubescent or glabrous with a thick margin of hairs.
 Leaves mostly ternate; stipules with processes 1-2 mm. long and glandular at the apex.....*C. Brassii*.
 Leaves opposite; stipules dentate, the teeth apparently being glands along the margin.
 Stipules pubescent outside; midrib of leaves sparsely hirtellous beneath.
 Leaves smaller, $9-12 \times 3-3.5$ mm.....*C. Lamiana*.
 Leaves larger, $16-35 \times 3-8$ mm.....*C. habbemensis*.
 Stipules glabrous with a thick margin of hairs; leaves glabrous.....*C. novoguineensis*.

Coprosma divergens Oliver, Records Dominion Museum [N. Zeal.] 1: 44. 1942.

Brass collected two numbers (4215 and 4216) of this species, one ♂, the other ♀: it would seem that the numbers were mixed when duplicates were distributed, as no. 4216 in the Arnold Arboretum set is from a ♂ plant. However, the two are so much alike that the only difference we can see is that one has stamens where the other has styles, the calyx and corolla being alike in the two plants.

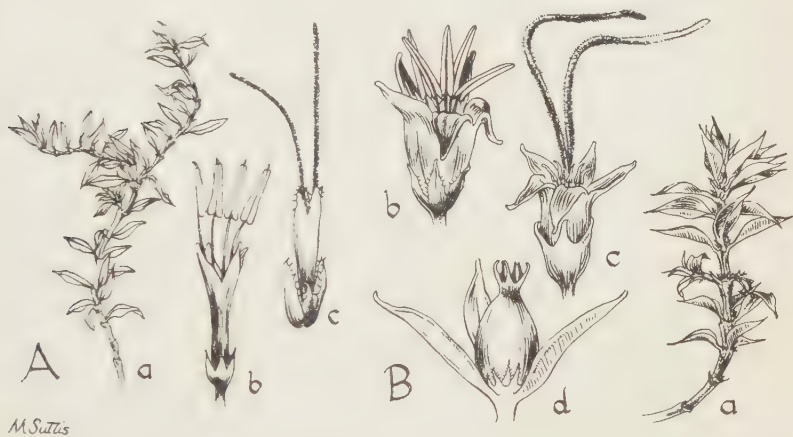


FIG. 11. A. *Coprosma Archboldiana* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. ♂ flower, $\times 2\frac{1}{2}$; c. ♀ flower, $\times 2\frac{1}{2}$. B. *Coprosma Brassii* Merr. & Perry: a. habit, $\times \frac{1}{2}$; b. ♂ flower, $\times 2\frac{1}{2}$; c. ♀ flower, $\times 2\frac{1}{2}$; d. fruit, $\times 2\frac{1}{2}$.

Coprosma Archboldiana sp. nov. FIG. 11, A.

Frutex prostratus; caulibus minute hirtellis vel glabris, ramosis; internodiis 4-10 mm. longis; foliis oppositis, lineari-lanceolatis, 0.6-1 cm. longis, 2.5-3 mm. latis, apice acutis, basi in petiolo marginato 1-3 mm. longo fere 1 mm. lato angustatis, margine consperse ciliatis, pilis brevibus, utrinque glabris minute rugulosis, costa tantum manifesta; stipulis cum petiolorum basibus connatis, vaginantibus, margine minute dentatis, ciliatis; floribus sessilibus terminalibus: ♂: calyce brevi, inaequaliter 4-dentato, minute ciliato; corolla tubiforme, tubo 7 mm. longo, lobis 2 mm. longis, lanceolatis; staminibus 4, filamentis 1.2 cm. longis, antheris sagittatis apiculatis, 3-4 mm. longis; ♀: calyce 4-lobato, lobis 2-4 mm. longis, plerumque 2 quam reliquis brevioribus, sparsim ciliatis; corolla tubiforme, tubo 7 mm. longo,

lobis lanceolatis, 2 mm. longis, costa et apice sparsim ciliatis; staminibus nullis; stylis 2, 1.5–2 cm. longis, minute papillois; baccis globosis, 6 mm. diametro.

NETHERLANDS NEW GUINEA: 5 km. east of Wilhelmina-top, *Brass* 9411, Aug. 1938, alt. 3650 m., matted on exposed rock-faces; 11 km. northeast of Wilhelmina-top, *Brass & Myer-Drees* 9817, Sept. 1938, alt. 3400 m., alpine grassland, dwarf shrub prostrate on sandy beaches of a stream; 7 km. northeast of Wilhelmina-top, *Brass & Myer-Drees* 9831 (TYPE), Sept. 1938, alt. 3560 m., pendent in great cushion-like masses on moist semi-shaded cliffs (fruit red, globose, soft, fleshy).

Coprosma Archboldiana appears to be related to *Coprosma ernodeoides* A. Gray and to the group of *Coprosma pumila* (*C. pumila* Hook. f., *C. nivalis* Oliver, *C. Petrici* Cheesem.). *Coprosma Archboldiana* differs from all of these in the definitely lobed calyx of the ♀ flower. The stipules are very short and some of the younger ones under a lens seem to be minutely denticulate. The calyx of the ♂ flower appears to have four teeth of unequal length, but in between these are minute denticulations which might possibly suggest that the calyx is a transitional form. The corollas of both ♂ and ♀ flowers are alike in size and shape in the New Guinean material. In the species mentioned above the corolla of the ♀ flower is always shown as the smaller in Oliver's monograph. Nevertheless it must be noted that the habit, the relative size of the leaves, the solitary terminal flowers, and the trumpet-shaped corolla all indicate a close relationship among these species.

Coprosma Brassii sp. nov. FIG. 11, B.

Frutex 1.5–2.5 m. altus, ramosus; ramulis ultimis plerumque ternatim verticillatis, obtuse 3-angulatis, patenti-hirtellis, pilis brevibus, internodiis 3–10 mm. longis, partim stipulis obtectis; foliis ternatim verticillatis, 1–1.7 cm. longis, 0.4–0.7 cm. latis, lanceolatis vel ovatis, rigide coriaceis, apice cuspidatis, basi in petiolo 1–2 mm. longo angustatis, utrinque glabris, margine minute papillois vel erosulis; costa tantum manifesta, supra impressa subtus prominente; stipulis firmis extus glabris, circiter 2 mm. longis, in axillis supra folia breviter connatis, margine fimbriatis, processibus inaequalibus centrali longiore (2 mm. longo, 0.2 mm. lato), margine pubescentibus, pilis ± densis 0.2 mm. longis; floribus sessilibus solitariis vel 4 ad apicem ramulorum; ♂ : calyce ± turbinato, 4–6-dentato, dentibus circiter 2 mm. longis, acutis, minute ciliatis vel glabris; corolla campanulata, tubo 3–4 mm. longo, lobis ovatis aequilongis, recurvis vel patentibus; staminibus 4–6, exsertis, antheris 4 mm. longis, apiculatis; ♀ : calyce ± turbinato, 4–6-dentato, dentibus 1.5 mm. longis, glabris; corolla campanulata, tubo 2–3 mm. longo, lobis circiter 3 mm. longis; staminibus partim inclusis vel inclusis, parvis; stylis 2, ± 1.5 cm. longis, minute papillois; baccis ellipsoideis, circiter 6 mm. longis (calyce persistente inclusis), 4 mm. diametro.

NETHERLANDS NEW GUINEA: 11 km. northeast of Wilhelmina-top, *Brass & Myer-Drees* 9807, 9809, Sept. 1938, alt. 3400 m., occasional in forest-edges (robust shrub 2 m. high; fruit red); 7 km. northeast of Wilhelmina-top, *Brass & Myer-Drees* 9842, 9843 (TYPE), Sept. 1938, alt. 3560 m., very abundant on forest-borders (large weak shrub of brownish appearance, 1.5–2.5 m. tall); 2 km. east of Wilhelmina-top, *Brass & Myer-Drees* 10221, 10304, Sept. 1938, alt. 3800 m., common in glades and forest-borders, sub-alpine forest (lax shrub 1.5–2 m. high).

This species seems to belong to the group of *Coprosma sundana*, according to Oliver's monograph. In nos. 9807 and 9809 the branchlets are nearly glabrous, but the collections do not seem to differ from the others in any other character. The dominant arrangement of both leaves and branchlets is ternate, although we have noted one node with only opposite leaves, also in another plant there is one verticil containing four rather than three branches. One flower of the type has three styles, but all others examined have two. The flowers are terminal and solitary or surrounded by three younger buds probably axillary at the next node, the internode between being so short as to give the appearance of four flowers clustered together. At the base of each flower is a whorl of reduced leaves and their stipules. The distinctive characters of the species are: the ternate arrangement of the leaves, their glabrousness, and under a lens the minutely eroded margin which appears as if it might have been papillate (possibly pubescent) or glandular; and the fimbriately margined stipules forming a very short sheath, the processes glabrous on the outside but the margin hairy (scarcely in a single line as cilia), the middle one being the longest of five or seven which extend from the margin of a single stipule.

Coprosma habbemensis sp. nov.

Frutex 3-5 m. altus, ramosus; ramulis minute hirtellis; internodiis 0.5-1.3 cm. longis; foliis oppositis, subcoriaceis, oblongis, 1.6-3.5 cm longis, 0.3-0.8 cm. latis, apice acutis et minute cuspidatis, basi in petiolo 1.5-3 mm. longo angustatis, margine ciliolatis, supra glabris, subtus costa sparsim patentihirtellis, nervis lateralibus obscuris vel interdum subtus manifestis utrinsecus 7-10; stipulis firmis triangularibus, 2-3 mm. longis, supra folia 1 mm. connatis, versus apicem margine glandulis 3 vel 4 dentatis, extus minute hirtellis, margine dense breviter ciliatis; floribus solitariis vel 2 vel 3 ad apicem ramulorum; σ : calyce 4(-6)-dentato, dentibus inaequalibus = 1 mm. longis, glabris, margine minute ciliatis; corolla campanulata, tubo = 2.5 mm. longo, lobis 4(-6), anguste ovatis aequilongis; staminibus 4 exsertis, antheris circiter 5 mm. longis, apice mucronulatis, basi sagittatis; φ : calyce ut in σ ; corolla campanulata, tubo \pm 2 mm. longo, lobis 3-4 mm. longis; staminibus parvis, filamentis brevissimis, antheris inclusis; stylis 2, circiter 1.5 cm. longis, minute papilloisis; baccis in sicco ellipsoideis, circiter 7 mm. longis et 5 mm. diametro.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass* 9367, Aug. 1938, alt. 3225 m., common in open parts of subalpine forest (tree or shrub 3-4 m. high); 9 km. northeast of Lake Habbema, *Brass* 10587 (TYPE), 10588, 10929, Oct. 1938, alt. 2800 m., abundant in forest second growths on landslips, native clearings, and openings (scrambling shrub 2-5 m. high; fruits orange in no. 10587, red in no. 10929).

This species is closely related to *Coprosma Wollastonii* Wernh. from the Carstensz Mountains; in fact, we have hesitated for some time whether to consider this a more pubescent form of *C. Wollastonii* or a distinct species. The peculiar combination of characters of Wernham's species (leaves scabrous above, midrib beneath clothed with scattered stiff hairs, hispid margin, glabrous stipules, glabrous branchlets), as well as the characters found in *C. novoguineensis*, have finally influenced us to believe that this is a distinct species. Apart from the size of the leaves, the longer hairs on the

midrib beneath, the more conspicuous stipules, and the much more open habit, *C. habbemensis* is very similar to *C. Lamiana* Oliver.

Coprosma novoguineensis sp. nov.

Frutex plerumque 1–1.5 m. altus, ramosissimus; ramulis ultimis brevibus, pubescentibus; internodiis brevissimis saepissime stipulis fere obtectis; foliis oppositis, in sicco rigide subcoriaceis, confertis, lanceolatis vel ovatis, 0.6–1.5 (–2.2) cm. longis, 0.2–0.6 cm. latis (in specimine typico 0.6–0.8 \times 0.2–0.3 cm.), apice cuspidatis, cuspide 1–1.8 mm. longa, basi rotundatis vel obtusis deinde subabrupte in petiolo 0.5–1 mm. longo angustatis, utrinque glabris, costa supra impressa, subtus prominula, nervis lateralibus obscuris vel interdum sub lente utrinsecus 3 vel 4 inconspicue manifestis; stipulis firmis, obtuse ovatis, 2 (–3) mm. longis, margine denticulatis (dentibus \pm caducis) etiam dense pubescentibus, pilis 0.2 mm. longis, patentibus, ceterum glabris; floribus solitariis vel 2 vel 3 ad apicem ramulorum; δ : calyce 4- vel 5-dentato, dentibus circiter 1 mm. longis, glabris vel in margine inferiore et inter dentes minute ciliatis; corolla campanulata, tubo 3 mm. longo, lobis 4 vel 5, anguste ovatis aequilongis; staminibus 4 vel 5, filamentis 6 mm. longis, antheris 4 mm. longis, mucronulatis; η : calyce et corolla ut in δ ; staminibus inclusis parvis; stylis 2, circiter 9 mm. longis, minute papillois; baccis ellipsoideis, circiter 5 mm. longis et 3 mm. diametro.

NETHERLANDS NEW GUINEA: 11 km. northeast of Wilhelmina-top, *Brass & Myer-Drees* 9705, 9706, 9707, Sept. 1938, alt. 3400 m., grassy place (shrub 1.5 m. high; flowers brownish, the anthers somewhat violet; ripe fruits orange); 7 km. northeast of Wilhelmina-top, *Brass & Myer-Drees* 9933, Sept. 1938, alt. 3740 m., in edge of forest, not common (very slender sparsely foliated tree 3.5 m. high); same locality, *Brass & Myer-Drees* 9939 (TYPE), 9940, Sept. 1938, alt. 3900 m., plentiful on grassy summits (shrub 1 m. high; fruit red, fleshy); 2 km. east of Wilhelmina-top, *Brass & Myer-Drees* 10378, 10380, alt. 3700 and 3750 m., in marginal shrubberies of subalpine forest; Lake Habbema, *Brass* 9028, 9063, 9144, 9145, 13736A, Aug. 1938, alt. 3225 m., abundant in shrubberies bordering forest (loose straggling shrub 1.5–2.5 m. high).

The collections from Mount Wilhelmina are fairly uniform except for nos. 9933 and 9706. The first has leaves 1.5 \times 0.5 cm., the second 1 \times 0.6 cm.; apart from these two collections, the rest have leaves 0.6–0.9 \times 0.2–0.4 cm. tending to dry very loosely folded along the midrib. All have very short internodes and are profusely branched, thus giving the impression of a compact habit. In the collections cited from Lake Habbema we can find no real differences. The glands or teeth along the margins of the stipules do not seem to have shrunk as much as in the Mount Wilhelmina material, and the specimens show both a compact and a loose habit; there is a wide variation in leaf-size, the two extremes being no. 9145 with leaves 1.3–2.2 \times 0.2–0.5 cm., and no. 9028 with leaves 0.7 \times 0.4 cm., the latter having very crowded nodes and the stipules also being short; in no. 9145, on the other hand, the nodes are 5–10 mm. long, and the stipules are also long. In practically all the collections the yellowish stipules are conspicuous. *Coprosma Lamiana* Oliver, collected at the base of Doorman-top, differs only in the longer pubescence of the branchlets, the dense pubescence of the stipules (on account of which there is practically no line of demarcation between stipules and branchlet at the base of the stipules), and the few short hairs on the midrib beneath.

Coelospermum Blume

Coelospermum reticulatum (F. v. Muell.) Benth. Fl. Austr. 3: 425. 1867; F. M. Bailey, Queensl. Fl. 3: 769. 1900.

Pogonolobus reticulatus F. v. Muell. Fragm. Phytogr. Austr. 1: 56. 1859.

BRITISH NEW GUINEA: Tarara, Wassi Kussa River, *Brass* 8565, December 1936, more or less gregarious on savanna-forest ridges (stiff erect shrub growing to 30–100 cm. from a somewhat fleshy rootstock; flowers white; leaves opposite and in 3's).

Previously reported from Queensland and North Australia.

Morinda Linnaeus

Morinda costata sp. nov. FIG. 1, A.

Planta scandens glabra; ramulis subteretibus, internodiis 2–7 cm. longis, novellis compressis; stipulis in vaginam brevissimam connatis, inconspicuis; foliis 6–11.5 cm. longis, 2.5–4.5 cm. latis, oblongo-lanceolatis, apice sensim acuminatis, acumine obtuso, basi rotundatis vel obtusis, interdum in petiolum angustatis, coriaceis, nervis lateralibus utrinsecus 5 vel 6 inter se remotis, patentibus versus marginem arcuatis et conjunctis, utrinque prominulis, subtus in axillis domatiiferis, reticulo laxo utrinque sub lente distincte manifesto; petiolo 6–12 mm. longo; inflorescentiis non visis; syncarpiis in ramis terminalibus sessilibus, oppositis, subglobosis, \pm 3.5 cm. diametro, 12–17-carpiis; baccis circiter 8 mm. ultra basim connatis; bacca singula circiter 1.5 cm. longa, parte superiore libera (circiter 1–1.3 cm. diametro), crassiuscula, irregulariter 4- vel 5-angulata, longitudinaliter sulcata, pyrenis 4 subosseis, oblongis vel obovatis, circiter 8 mm. longis, complanatis.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, *Brass* 13012 (TYPE), Feb. 1939, alt. 1200 m., frequent in rain-forest (large canopy liane; fruit red, costate).

Morinda costata seems to be most like *M. Grayi* Seem., from Fiji, but the leaves have shorter petioles, and the syncarps are much larger and sessile in the New Guinean material. Among the New Guinean species *M. costata* is somewhat like *M. glomerata* (Blume) Miq., but in the latter the syncarps are short-pedunculate, the berries are smaller, and there is practically no thin calyx-margin, i. e. the entire wall is thickened around a cup-shaped opening about 5 mm. in diameter; in *M. costata*, on the other hand, there is a thin calyx-margin about 2 mm. wide projecting beyond the fleshy free costate part of the berry, leaving an opening at the apex about 3 mm. in diameter.

Morinda glomerata (Blume) Miq. Fl. Ind. Bat. 2: 247. 1857; Val. Nova Guin. Bot. 8: 515. 1911.

Sphaerophora glomerata Blume, Mus. Bot. Lugd.-Bat. 1: 179. 1850.

NETHERLANDS NEW GUINEA: Hollandia, *Brass* 9003, July 1938, large rain-forest liane. BRITISH NEW GUINEA: Budatobara, *Brass* 772, Dec. 1925, alt. about 90 m., liane in rain-forest. SOLOMON ISLANDS: Ysabel: Tasia, *Brass* 3273, Dec. 1932, large liane in lowland rain-forest.

These collections are all in fruit but seem to match the description fairly well; the species has been reported previously only from Netherlands New Guinea.

Morinda jasminoides A. Cunn. in Hook. Bot. Mag. 61: *t.* 3351. 1834; F. M. Bailey, Queensl. Fl. 3: 768. 1900.

NETHERLANDS NEW GUINEA: Angi, Arfak Mountains, *Kanehira & Hatusima* 13798, April 1940, alt. 1900 m., scandent in thicket by Iray, Lake Giji. BRITISH NEW GUINEA: Bella Vista, Central Division, *Brass* 5443, Nov. 1933, alt. 1450 m., in forest (small climber with cream-colored flowers on a globose receptacle; fruit orange-yellow, 1.2–1.3 cm. diameter).

The above cited material seems to be a very good match for the Australian collections of this species at hand.

Morinda salomoniensis Engl. Bot. Jahrb. 7: 478. 1886; Val. Bot. Jahrb. 61: 154. 1927.

NORTHEAST NEW GUINEA: Ogeramung, *Clemens* 4835, Jan. 1937, alt. about 1750 m., forest-hills (vine; fruit red); Sarawaket, Camp Kilanda, *Clemens* 5236, alt. 2100 m. BRITISH NEW GUINEA: Mafulu, *Brass* 5187, Oct. 1933, alt. 1250 m., in tall forest (large liane with rigid branchlets; leaves very dark green; fruit red).

These collections all seem to agree with the description of *Morinda salomoniensis* Engl.; there is only one character shown here which is not mentioned in the original description: the corolla-tube as well as the throat is hairy within.

Morinda hirtella sp. nov.

Planta scandens; ramis hirtellis, brunnescentibus vel viridescentibus; internodiis novellis compressis, \pm angulatis; stipulis hirtellis, novellis probabiliter tubulatis cito uno latere fissis, 3–4 mm. longis, truncatis; foliis ellipticis, 4–10 cm. longis, 1.8–5.5 cm. latis, vel interdum oblongo-lanceolatis, 11×3.4 cm., tenuiter coriaceis, apice plerumque abrupte acuminatis, interdum obtusis cum acumine 3–10 mm. longo acuto, basi rotundatis vel novellis cuneatis, supra sparsim et breviter hirtellis, subtus (costa et nervis densius) non dense hirtellis, nervis lateralibus utrinsecus 7–9 oblique ascendentibus, supra manifestis, subtus prominulis, reticulo utrinque manifesto, subtus sub lente fere prominulo; petiolo 6–10 mm. longo, gracili, hirtello; inflorescentiis terminalibus, umbellatis vel subumbellatis; capitulis parvis \pm 9-floris, pedicellatis, pedicellis 11–20, gracilibus, \pm 1.5 cm. longis, hirtellis; floribus ut videtur unisexualibus; calyce cupuliformi, integro glabro; corolla extus puberula; tubo 1 mm. longo, lobis 3–5, circiter 4 mm. longis, oblongis, intus dense longe albo-barbatis, apice glabris; staminibus 3–5 tubo inter lobos insertis, filamentis brevibus, antheris 2.5 mm. longis dorso ad basim affixis; stylo non viso; disco prominente; capitulis fructiferis in sicco circiter 10 mm. diametro, 6–8 mm. altis; baccis in parte superiore vix liberis, pyrenis 3 vel 4 obovatis, dorso convexis, osseis.

NORTHEAST NEW GUINEA: Above Heldsbach, *Clemens* 1957, March 1936, alt. \pm 600 m., vine on roadside (fruit vivid orange). BRITISH NEW GUINEA: Lower Fly River, east bank opposite Sturt Island, *Brass* 7984 (TYPE), rain-forest, large canopy liane of the ridges (branches corrugated; flowers green).

This is another of the species with umbellate inflorescences, in some ways suggesting *Morinda mollis* A. Gray, of Polynesia, but with many more pedicels to the umbel and with glabrous calyces. With so little material we are unable to say whether the species always has unisexual flowers or not, but in the six flowers (taken from two heads in different umbels) examined we did not find even a rudimentary style; the corolla is mostly 4- or 5-lobed, but occasionally 3-lobed ones were observed.

Morinda micrantha Val. Bot. Jahrb. 61: 153. 1927.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *Brass* 7756, Sept. 1936, rain-forest substage liane (fruit-heads orange-yellow, less than 1 cm. diameter); Tarara, Wassi Kussa River, *Brass* 8505, 8675, Dec. 1936, Jan. 1937, large liane, common in rain-forests (flowers green; fruits orange-colored, 5-8 mm. diameter).

Described from Northeast New Guinea. The three cited collections indicate the variation in the species; the leaves vary from 5 to 11 cm. in length and 2.5-7 cm. in breadth, the leaf-tips in some instances with an acumen 1 cm. long, in others almost rounded with a mucro 2 mm. long; the umbels have 10-20 pedicels each bearing a 5-9-flowered head: the corolla-tube is about 1 mm., the lobes 2.5 mm. long.

Morinda oligocephala sp. nov.

Frutex scandens glaber; ramulis subteretibus; internodiis 2.5-5 cm. longis, novellis gracilibus; stipulis parvis, late ovatis, obtusis, caducis; foliis 5-10 cm. longis, 2-5 cm. latis, anguste ellipticis vel ovato-ellipticis, apice breviter acuminatis vel acutis, basi rotundato-cuneatis vel late obtusis, tenuiter coriaceis vel rigide chartaceis, nervis lateralibus utrinsecus 6-8 utrinque perspicuis patentibus, versus marginem arcuatis et confluentibus, subtus in axillis domatiiferis, reticulo laxo utrinque prominulo; petiolo 5-10 mm. longo, canaliculato; inflorescentiis umbellatis, terminalibus et interdum in axillis foliorum superiorum dispositis; capitulis 2- vel 3-floris, pedicellatis, pedicellis 4, circiter 5 mm. longis; calyce vix 0.5 mm. longo, minute 4- vel 5-dentato; corollae tubo 4 mm. longo, extus glabro, intus pubescente, lobis 4 vel 5, oblongis, 5 mm. longis, extus glabris, intus dense albo-barbatis; staminibus 4 vel 5 tubo inter lobos insertis, filamentis brevissimis, antheris subsessilibus, 2.5 mm. longis; stylo 7 mm. longo, stigmatibus 2-3 mm. longis; vel filamentis 4 mm. longis, antheris 2.5 mm. longis, stylo 4 mm. longo, stigmatibus 3 mm. longis; capitulis fructiferis non visis.

BRITISH NEW GUINEA: Tarara, Wassi Kussa River, *Brass* 8490 (TYPE), Dec. 1936, underbrush of light rain-forest (climbing shrub; flowers cream-colored).

This species is readily distinguished by the rather prominently reticulate leaves, the predominantly 4-pedicelled umbels, and the few-flowered heads. The umbels are sessile, subtended by two leaves, but these sometimes have fallen, giving the impression at first glance of a pedunculate umbel.

Galium Linnaeus

Galium asperifolium Wall. Fl. Ind. 1: 381. 1820; van Steenis, Bull. Jard. Bot. Buitenz. III. 13: 247. 1934.

NETHERLANDS NEW GUINEA: Angi, Arfak Mountains, *Kanehira & Hatusima* 13666, April 1940, alt. 1900 m., in open wet grassy field on inundation-area of Iray River running to Lake Giji.

According to van Steenis the species is known from SE. Asia, Sumatra, Java, and the Philippines.

Galium innocuum Miq. Fl. Nederl. Ind. 2: 341. 1857; van Steenis, Bull. Jard. Bot. Buitenz. III. 13: 247. 1934.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass* 9286, Aug. 1938, alt. 3225 m., scrambling to 50 cm. on tall marsh grass, common.

Van Steenis gives the range of this species as the Philippines, the Moluc-

cas. Java, and Sumatra. This seems to be the first record of it from New Guinea.

Galium novoguineense Diels, Bot. Jahrb. 62: 493. 1929; van Steenis, Bull. Jard. Bot. Buitenz. III. 13: 247. 1934.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass* 9511, 9548, Aug. 1938, alt. 3225 m., occasional in moist forest-edges; 7 km. northeast of Wilhelmina-top, *Brass & Myer-Drees* 9859, Sept. 1938, alt. 3560 m., pendent on mossy trees in forest-edges, common.

Previously collected only in Northeast New Guinea (Sarawaket).

Galium australe DC. Prodr. 4: 608. 1830; Benth. Fl. Austr. 3: 446. 1867; F. M. Bailey, Queensl. Fl. 3: 782. 1900.

BRITISH NEW GUINEA: Murray Pass, Wharton Range, *Brass* 4730, Aug. 1933, alt. 2840 m., common on wet banks of a creek flowing through grassland. Australia.

Galium rotundifolium Linn. Sp. Pl. 108. 1753, sensu lato.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, *Brass* 10731, Oct. 1938, alt. 2800 m., spreading and ascending herb massed on a native clearing in the forest. BRITISH NEW GUINEA: Murray Pass, Wharton Range, *Brass* 4736, 4945, Aug. 1933, alt. 2840 m., plentiful amongst coarse grass on banks of a grassland creek, also a few plants in a fern-brake on the edge of the forest.

Probably *Brass* 9321 from Lake Habbema is also a depauperate form. This is perhaps the same species which F. v. Mueller designated as *Galium javanicum* Miq. The whole complex is in need of careful study by a specialist of the group.

Galium subtrifidum Reinw. in Blume, Bijdr. 944. 1826; DC. Prodr. 4: 594. 1830.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, *Brass* 11423, Nov. 1938, alt. 2200 m., trailing and pendent to a meter [in length] on a dry face of limestone in the forest; Angi, Arfak Mountains, *Kanehira & Hatusima* 13590, 13820, April 1940, alt. 1900 m., in open marsh by Lake Gita, and in secondary forest at Iray. BRITISH NEW GUINEA: Murray Pass, Wharton Range, *Brass* 4946, Aug. 1933, alt. 2840 m., bank of an open grassland gully, rare.

The collections seems to be a good match for a Javanese collection so-named by van Steenis.

Galium bryoides sp. nov.

Planta perennis glabra; caulibus numerosis, ramosis, caespitosis, decumbentibus vel humifusis, probabiliter 7–10 cm. longis; ramis quadrangulatis, internodiis 1–5 mm. longis; foliis quaternis, sessilibus, lineari-lanceolatis 2.5–4 mm. longis, 0.4–0.8 mm. latis, apice attenuato-acuminatis et mucronulatis, basi leviter angustatis, margine planis, patentibus vel recurvatis, supra enerviis, subtus 1-nerviis, luce permeante laxe reticulato-venosis; floribus axillaribus solitariis, pedunculis sub anthesin subnullis, fructiferis usque 0.5 mm. longis; corolla rosea, 4-partita, lobis vix 1 mm. longis, ovatis; staminibus quam lobis brevioribus; stylis 2 distinctis, stigmatibus capitatis; fructibus circiter 1 mm. longis, glabris et sub lente minute papilatis; embryo tantum leviter curvo.

BRITISH NEW GUINEA: Mount Albert Edward, southwestern slope, *Brass* 4416 (TYPE), July 1933, alt. 3680 m., several plants in a wet grassland hollow, rare (flowers pink).

This is a very distinct plant readily recognized by the glabrous character, the small and slender leaves, the matted habit, the very short peduncles, and the glabrous fruits.

MORPHOLOGY AND RELATIONSHIPS OF TROCHODENDRON AND TETRACENTRON

II. INFLORESCENCE, FLOWER, AND FRUIT

CHARLOTTE G. NAST AND I. W. BAILEY

With five plates

INTRODUCTION

THE FIRST paper (4) of this series dealt with the morphology of the stem, root, and leaf of *Trochodendron* and *Tetracentron* and with significant palaeobotanical data. The present paper will deal with the morphology of the inflorescence, the floral organs, and the fruit, and will conclude the series with a general discussion of the relationships of these remarkable dicotyledons. In so doing, we shall present evidence in support of Dr. Smith's (10) conclusion regarding the close affinities between the two genera.

INFLORESCENCE

TROCHODENDRON. The buds of this genus have numerous scales. When a vegetative bud expands, the smaller outer scales soon drop off, but the inner larger cataphylls are persistent for a season and become separated by internodal elongation. A pseudoverticillate cluster of leaves of varying sizes develops above these cataphylls, and the axis terminates in a maturing bud. The growth of such a vegetative shoot obviously is monopodial.

When a flower bud of *Trochodendron* expands, the numerous cataphylls are early deciduous, and the stem is extended as the primary axis of an inflorescence, *Fig. 1*. This rachis usually, but not invariably, terminates in a flower. It bears numerous elongated bracts, in the axils of most of which secondary flower-bearing axes are formed. In certain cases, the lowermost of these structures are branched, thus giving rise to tertiary floral axes, *t. fl.*, *Fig. 1*. Even when the rachis terminates in a flower, the uppermost bracts tend to be reduced in size and have no flowers in their axils. Elongated bracteoles do not develop on secondary axes except where these axes are branched. A vegetative bud occurs in the axil of the last sterile scale at the base of the inflorescence, *ax. b.*, *Fig. 1*. This bud extends the vegetative part of the shoot, which, therefore, is of a sympodial type.

It is evident, accordingly, that the inflorescence of *Trochodendron* is terminal and that it is a raceme-like pleiochasium with occasional tertiary floral axes. The occurrence of such tertiary axes and the not infrequent absence of a terminal flower render difficult the acceptance of Wagner's (12) interpretation of the inflorescence as an interrupted "primanpleiochasium."

TETRACENTRON. The vegetative buds of the long shoots of *Tetracentron* have two elongated scales, occasionally reduced to one in the axillary bud

closest to the apex of the shoot. Within the bud scales there is a tiny leaf, having a terminal bud primordium enclosed within its stipular flange. The extension of the shoots is by monopodial development.

The flower buds of *Tetracentron* are borne on short shoots, and at first are enclosed within the stipular flanges of a leaf (*o. lf.*) as illustrated in *Fig. 3*. Each matured flower bud has two scales, within which are an incipient inflorescence (*infl. ax.*) and a short axis bearing a small leaf (*lf.*) enclosed within an enveloping scale (*br. 3*). The subsequent development of the short axis, *Fig. 2*, crowds the inflorescence into an apparently lateral position. That the inflorescence actually is terminal and the leaf-bearing shoot axillary is indicated, however, by topographical relationships within the flower bud, *Fig. 3*. The occurrence of a bud (*ax. b.*) in the axil of the leaf (*o. lf.*) demonstrates that the flower bud is terminal. Similarly, the occasional formation of a rudimentary bud in the axil of the lower bud scale (*br. 1*) indicates that the inflorescence is terminal and that the short leaf-bearing axis is lateral, i.e. develops from a bud in the axil of the inner scale (*br. 2*) of the flower bud. Such an interpretation of the morphology of the short shoot is supported by the orientation of the scale (*br. 3*) of the inner axillary bud (*t. m.*). This scale is set at right angles to the scales (*br. 1* and *2*) of the flower bud, and its orientation in relation to the axis of the inflorescence is the same as that of the scales of axillary buds to the axis of long vegetative shoots.

The apical primordium (*t. m.*) of the leaf-bearing axillary shoots forms the flower bud of the next year. It is evident, accordingly, that the inflorescences of *Tetracentron* are terminal and that the development of the short shoots is sympodial. The inflorescence is a spike with numerous sessile flowers, each subtended by a minute bract, *Fig. 4, br.* The flowers tend to be arranged in false whorls. Four decussate bracts are usually present at the apex of the axis, but occasionally the rachis may terminate in a flower.

FLOWERS

PERIANTH. The sessile, tetramerous flowers of *Tetracentron*, *Fig. 4*, have four sepals oriented opposite to the stamens. The flowers of *Trochodendron* generally are considered to be without a perianth, but Hutchinson (7), in defining the Trochodendraceae (*Euptelea* and *Trochodendron*), states that sepals are absent or very minute. Most of the axillary flowers of the inflorescence have a pair of tiny, unvascularized¹ scales, *br.*, *Figs. 6* and *7*, that commonly are attached to the base of the torus or less frequently at a somewhat lower level. The terminal flower of the rachis may have three or four of these rudimentary appendages. The higher levels of attachment suggest that the scales may be vestiges of a calyx. It should be noted in this connection, however, that the broad bases of the scales are decurrent and embossed, *Fig. 7*, as are those of the bracts on the rachis and of elon-

¹ In contrast to the normal elongated bracts and bracteoles of the inflorescence, which have a single vascular strand. The minute bracts of *Tetracentron* also have a single trace.

gated bracteoles on branched secondary, flower-bearing axes. Furthermore, the androecium is perigynous and the stamens appear to be attached to the dorsal surfaces of the carpels. The subtending scales may, therefore, be rudimentary bracteoles that have been upwardly displaced onto the surface of the receptacle. It is unfortunate that there are no vascular strands in these structures to aid in their interpretation.

ANDROECIUM. The numerous stamens of *Trochodendron* are borne individually upon cushions that tend to be linearly arranged on more or less embossed and decurrent ridges of the dorsal surface of the carpels, *Figs. 6 and 7*. The four stamens of *Tetracentron* are borne alternately to the carpels and do not exhibit external evidences of perigyny.

The stamens of the two genera are, however, of a fundamentally similar morphological type. The filaments terminate in a relatively massive instead of a much constricted connective as in *Drimys* (Bailey and Nast, 2), and the four sporangia are not conspicuously protuberant as in many dicotyledons. The endothecium is neither as restricted as in *Degeneria* and *Himantandra* (1) nor as extensive as in the Winteraceae, where it completely jackets the sporangia. In *Tetracentron* and *Trochodendron*, it is a continuous subepidermal layer, not only external to the sporangia, but also extending across the adaxial and abaxial sides of the connective, *Figs. 22 and 23*. It differentiates first in the region of the sporangia and subsequently in the connective. Its maturation in *Trochodendron* is completed before dehiscence of the pollen, whereas its differentiation in the connective of *Tetracentron* may be markedly retarded. Dehiscence is longitudinal-lateral, giving to the anther a bivalvular appearance.

POLLEN. Van Tieghem (11) described the pollen of *Trochodendron* as simple, spherical grains with three pores, the pollen of *Tetracentron* as simple, somewhat flattened pentagonal grains with smooth surfaces and having five pores. He provided no illustrations, and his descriptions are inadequate and quite inaccurate in the case of *Tetracentron*.

As indicated in *Figs. 24 and 25*, the pollen of both genera are tricolpate with papillate, crest-like thickenings on the floor of each furrow. The grains have a conspicuous reticulately thickened outer surface, the appearance of which changes at different focal levels. If the outermost surface of the reticulation is brought into focus, the ridges are rather broad and the pits are small. At a lower focal level, the ridges appear quite narrow and the pits considerably wider. This difference in surface views is due to the conformation of the ridges and can be most convincingly demonstrated in thin sections of pollen grains cut at right angles to their surface. Such a section, one micron in thickness, is illustrated in *Fig. 26*. The basal part of the ridges is very narrow, whereas the external part is much thicker, appearing almost bulbous in sectional view. The ridges project outward from a thick relatively homogeneous layer of the exine, within which is a thin, very hyaline layer, presumably the intine. It is the latter layer that forms the floor of the furrows and supports the crest-like thickenings of papillate exine.

Although the pollen grains of *Tetracentron* and *Trochodendron* are entirely unlike those of the Magnoliaceae and other ranalian families having monocolpate and derived types of pollen, they are of a general morphological type that occurs at times in other dicotyledonous families, e.g. in *Disanthus* (Fig. 27) of the Hamamelidaceae.

GYNOECIUM. The carpels of *Tetracentron* and *Trochodendron* are laterally concrescent, with free styles, Figs. 4 and 7. As in *Degeneria*, the section *Tasmannia* of *Drimys*, and *Himantandra*, the megasporophylls are adaxially folded or conduplicate with their ventral (upper) surfaces closely approximated, Figs. 9 and 12, thus leaving a cleft-like opening into the locule. The margins of the carpels are free except at the base of the syncarpous gynoecium, level A, Fig. 7. The conduplicate form of the carpel is not confined to the region of the locule but occurs throughout the style, Figs. 10 and 13.

The carpels have a conspicuous dorsal bulge which is greatly accentuated in *Tetracentron*, d. blg., Figs. 4, 12 and 13, and is nectariferous according to van Tieghem (11) in *Trochodendron*, Fig. 7. Insects evidently are attracted to this succulent parenchymatous region, for the dorsal bulge has frequently been chewed away in herbarium specimens of *Trochodendron*, Fig. 6.

In *Tetracentron*, where abaxial deformation of the carpels does not occur until after anthesis, the placentae are oriented parallel to the vertical axis of the flower and the ovules are set at right angles to this axis. In *Trochodendron*, where more or less abaxial deformation occurs prior to anthesis, the numerous ovules are set at right angles to the placentae, which are oriented in various diagonal positions in relation to the vertical axis of the flower, Fig. 7. The placentae are situated in the upper part of the locule, and particularly in the case of *Trochodendron* far back from the free margins of the conduplicate megasporophyll, Fig. 9.

OVULES. The ovules of *Trochodendron* are considered by van Tieghem (11) to have a unique development and morphological form, unlike that of any other known representative of the angiosperms. Each ovule has a pronounced sub-chalazal extension, Fig. 15, in which the vascular strand (or the procambium) makes a "hair-pin" turn. The nucellus and integuments develop laterally instead of terminally on the ovulary lobe, Fig. 14. The sub-chalazal projection, therefore, is actually an extension of the apex of the ovulary lobe and not to be confused with the unvascularized sub-chalazal emergences of *Bilbergia* and other genera.

Our observations, based upon somewhat inadequate herbarium material, tend to support van Tieghem's generalizations regarding the ovules of *Trochodendron*, and indicate that homologous, but less accentuated, characters occur in the ovules of *Tetracentron*. The sub-chalazal extension is present in ovules at an early stage of development where no procambium is discernible, Fig. 14, and also in younger ovules with incipient integuments and no evidences of a megaspore.

The matured ovules have two integuments. The outer one consists of

three layers of cells in both *Tetracentron* and *Trochodendron*, and is more massively developed at the micropylar end of the ovules. The inner integument is composed of two layers of cells.

VASCULARIZATION OF THE FLOWER. The elongated pedicel of *Trochodendron* contains a eustele composed of a varying number of vascular bundles. These bundles tend to increase in number toward the base of the flower. They branch and anastomose, forming new interfascicular regions as in the pedicel of *Drimys* (Nast, 8). Certain of them become cortical bundles², *cor. b.*, *Fig. 7*, at the base of the receptacle. They are variable in number, commonly about as numerous as the stamen-bearing ridges on the dorsal surface of the carpels. Each of the cortical bundles tends to give rise to three or four traces, one for each of the stamens of a particular ridge. Occasionally the cortical bundles branch and form twice as many staminal traces. Rarely does the individual trace of a stamen arise directly from the eustele.

The dorsal traces of the carpels diverge from the eustele at a level slightly below that of the base of the locules, *d.t.*, *Fig. 7*. They usually are discrete strands, although occasionally one may arise from a stelar bundle common to it and either a ventral or cortical bundle. The dorsal trace forms, *level B*, *Fig. 7*, two lateral branches, *l.d.t.*, *Figs. 7 and 8*. Toward the upper part of the carpel, the median and lateral dorsal strands divide and anastomose, forming a network of strands (*Fig. 7* shows the network of half of one carpel). A number of tiny branches of the dorsal strands extend a short distance into the parenchymatous dorsal bulge of the carpels and end blindly, *a*, *Figs. 7 and 9*.

The bundles which ultimately form the ventral traces of the carpels usually arise from stelar bundles that are common to them and to the cortical bundles which form the traces of the stamens, *Fig. 7, right*. At the level of the bases of the carpels, there is one of these bundles in each of the septa formed by the lateral concrescence of carpels, *v.b.*, *Fig. 7*. At a higher level, *level B*, *Figs. 7 and 8*, these bundles divide, their halves becoming ventral traces of the adjacent carpels, *v.t.*, *Fig. 7*. Most of the ovules are vascularized by branches of the two ventral traces. However, a dorsal strand anastomoses with each ventral bundle and the uppermost ovules are, therefore, vascularized by these fused strands, as in many of the Winteraceae (Bailey and Nast, 3).

The bundles of the eustele at the base of the sessile flowers of *Tetracentron* become abruptly and almost simultaneously dissociated into traces. The four large and very short outermost bundles, which are basically cortical, *cor. b.*, *Fig. 11*, produce four calycine traces, one to each sepal, and four staminal traces, one to each stamen. Occasionally a sepal may have an extra trace, *Fig. 12*. The vascularization of the carpels is fundamentally similar to that of the carpels of *Trochodendron*. Ordinarily there is a large dorsal trace, *d.t.*, *Fig. 11*, in the base of each carpel. This trace forms three strands, *Fig. 11, carpel at right*, which divide, *Fig. 11*, anastomose, *Fig. 12*,

² For definition of term refer to Nast (8).

and may redivide, *Fig. 13*. There are, in addition, four bundles which form ventral traces. At the base of the carpels, one of these bundles occurs in each of the septa of the laterally concrescent carpels. As in *Trochodendron*, these bundles divide to form ventral traces of adjacent carpels, *Figs. 11 and 12*. Both the ventral and the dorsal strands extend upward to the apex of the style. There is no fusion of ventral and dorsal strands in the vascularization of ovules, as in *Trochodendron*, possibly owing to the reduction in size of the carpels and in the number of ovules.

FRUIT AND SEED

The fruit of *Trochodendron* is a follicetum with ventral, loculicidal dehiscence. It is somewhat flattened at the apex, *Fig. 6*, with the styles of the follicles bent outwardly, forming spur-like appendages. In the development of the fruit the conduplicate ventral side of the sporophyll enlarges disproportionately to the dorsal side, thus displacing the styles and causing the fruit to become flattened at the distal end. The placentae, which are in a diagonal position in the flower, *Fig. 7*, assume in the fruit an apical or horizontal orientation with the seeds pendent in the locules. The fertile and interspersed sterile seeds are in two rows, one row on each placenta. The raphes or dorsal sides of the seeds are arranged back to back. This orientation of the seeds is the same as that of the ovules, which are heterotrous according to Agardh's terminology (Gray, 6, p. 282).

The fruits of *Tetracentron*, although superficially very different, are essentially similar in structure. The fruit of *Tetracentron* also dehisces loculicidally. However, the abaxial deformation of the megasporophyll, due to the extreme development of the conduplicate ventral side, is much more exaggerated in *Tetracentron* than in *Trochodendron*. The dorsal side or bulge, *d. blg.*, *Figs. 4 and 5*, retains approximately its original size. The ventral side, however, increases to such an extent that the styles, which are upright in the flower, assume a basal position, *Figs. 4 and 5*. There is also greater growth on the ventral or grooved sides of the styles than on the dorsal sides, so that the styles also curve abaxially, thus producing four hooked spurs in the fruit. With the over-extension of the ventral sides of the sporophylls, the placentae are brought from a vertical position at anthesis to a horizontal and apical position in the fruit. The seeds are thus pendent, with their dorsal sides or raphes back to back, as in *Trochodendron*.

The seeds of the two genera are strikingly similar in their anatomy. In both *Trochodendron* and *Tetracentron*, the raphe forms an embossed ridge throughout the length of the seed. Within this ridge is the raphe-bundle, which is surrounded by thick-walled cells, *Figs. 18 and 19*. The subchazal ends of the seeds are extended into a projection which is vascularized, *Figs. 16 and 17*. The funiculus is fairly short, with the micropylar end of the outer integument greatly enlarged and encroached upon it. The average size of the seed of *Tetracentron* is slightly smaller than that of *Trochodendron*.

Van Tieghem (11) and Netolitzsky³ (9) report two seed coats in *Trochodendron*. According to van Tieghem, the internal coat arises from the inner integument of the ovule and is composed of two layers of thin-walled, colorless cells. The outer seed coat is brown and has three layers, of which the medium is sclerous and arises from the outer integument of the ovule. In the case of *Tetracentron*, he merely mentions that the seed has a thick external integument, lacunous and soft.

Our observations on the seed coats do not agree with van Tieghem's descriptions. The three-layered outer integument of the ovule matures into an outer seed coat of thin-walled cells in both *Trochodendron* and *Tetracentron*, Figs. 18, 19, and 21a. In *Trochodendron*, the cells of the innermost layer of the external seed coat have thickened (cutinized?) anticlinal walls and a thickened external (i.e. adjacent to the inner seed coat) periclinal wall. It has, therefore, typical epidermal characteristics. The cells of the other two layers become flattened radially, Fig. 19, but are greatly extended longitudinally, giving a striated appearance to the body of the matured seed when cleared in NaOH. In *Tetracentron*, this inner layer is only slightly thickened, but the outer seed coat forms ridges by increase in size and number of its cells. These cells grow and expand into any available space between the seeds, which are tightly packed in the fruit. The resulting ridges give a winged appearance to the seeds of *Tetracentron*, Figs. 16 and 18, *opposite raphe*.

The external layer of the inner seed coat of both genera is sclerenchymatous. The cells are small in cross sectional diameter, Figs. 18, 19, and 21a, but greatly elongated, Fig. 20. This layer or sclerotesta also appears striated, due to its elongated cells, and is readily visible in cleared seeds, Figs. 16 and 17. Internal to the sclerotesta are thin-walled cells which are derived from the inner layer of the internal integument and the nucellus of the ovule.

The endosperm, which constitutes the greatest volume of the seed, is composed of thin-walled, isodiametric cells. The tiny embryo, embedded in the endosperm at the micropylar end of the seed, is either undifferentiated or has incipient cotyledonary development, Fig. 20.

In the sterile seeds, the endosperm is usually absent (a small amount is present in occasional sterile seeds of *Tetracentron*). Often the sclerenchymatous layer is all that remains of the inner seed coat. The inner layers of the outer seed coat, especially of *Trochodendron*, become densely sclerenchymatous. The numerous sterile seeds of *Trochodendron* are darkly and conspicuously castaneous.

RELATIONSHIPS

Although *Tetracentron* and *Trochodendron* differ conspicuously in their habit of growth, in the form and vascularization of their leaves, and in the grosser characters of their inflorescences and flowers, they exhibit many peculiarities of internal structure, organization, and development that are

³ Netolitzsky's description is apparently taken from van Tieghem.

fundamentally similar and that serve to differentiate these plants from other woody ranalian genera.

As emphasized in the first paper (4) of this series, the woods of *Tetracentron* and *Trochodendron* are remarkably similar and differ from those of other known angiosperms, including the vesselless Winteraceae. Particularly significant in this connection are transitions from typical transverse to diagonal and longitudinal planes of cell division in the maturation of wood parenchyma strands. This aberrant trend of cytological specialization is much exaggerated in *Tetracentron*.

The secondary phloems of the two genera are of the same morphological type. They do not have the precocious flaring of the multiseriate rays and the early stratification into narrow, alternating arcs of soft bast and fibers that occur so characteristically in the Magnoliaceae (sensu stricto), Degeneriaceae, and Annonaceae. Nor is there a sclerification of the multiseriate rays close to the cambium, as in *Euptelea* and many Winteraceae.

Although typical leaves of adult *Trochodendron* are exstipulate with multilacunar nodal attachments and commonly without buds in their axils, the earlier leaves formed by seedlings resemble the leaves of *Tetracentron* in having trilacunar nodal attachments and sheathing leaf bases that enclose axillary buds. Furthermore, the stomata of the two genera are of a peculiar and similar structural type.

There are similar tendencies toward reduction of internodal elongation both in the vegetative axes and the inflorescences, leading in *Trochodendron* to the periodic formation of pseudoverticils of leaves and to the clustering of axillary flowers on the upper part of the rachis, and in *Tetracentron* to the production of short shoots and of false whorls of sessile flowers on the rachis.

The complex patterns of vascularization of the flowers are essentially similar in both genera. The form of the open, conduplicate, laterally concrescent carpels is fundamentally the same. There is a similar abaxial deformation of the follicles which is merely more extensive in *Tetracentron* than in *Trochodendron*. The placentation, stamens, pollen, ovules, and seeds exhibit minor differences only. The vascularized, sub-chalazal projections of the ovules and seeds appear to be as unique among angiosperms as is the structure of the vesselless xylem.

The totality of the developmental, anatomical, and other morphological similarities between *Trochodendron* and *Tetracentron* is so large as to leave no doubt regarding the close affinities of the two genera. Whether the plants should be placed in a single family or in two separate but closely related monotypic families depends upon the taxonomic emphasis that is placed upon obvious differences in their foliage, inflorescences, and flowers.

As will be shown in subsequent papers by Dr. Smith and ourselves, the genus *Euptelea* exhibits no significant similarities to *Tetracentron* and *Trochodendron* in any of its vegetative or reproductive parts and, therefore, cannot be associated with *Trochodendron* in the Trochodendraceae.

It should be emphasized in conclusion that there are no cogent evidences

of close relationship between either *Tetracentron* or *Trochodendron* and the Magnoliaceae (sensu stricto), Degeneriaceae, Himantandraceae, Winteraceae, Schisandraceae, Cercidiphyllaceae, or Eucommiaceae.

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EXPLANATION OF PLATES

PLATE I

Ax. b., axillary bud; *br.*, bract; *br. sc.*, bract scar; *d. blg.*, dorsal bulge; *f. w.*, floral whorl; *infl. ax.*, inflorescence axis; *infl. sc.*, inflorescence scar; *lf.*, leaf; *lf. sc.*, leaf scar; *n. br.*, naked bract; *o. lf.*, old leaf; *pd.*, peduncle; *st. pd.*, stamen pad; *st. sc.*, stamen scar; *sty.*, style; *t. m.*, terminal meristem; *t. fl.*, tertiary flower; *v. su.*, ventral suture.

FIG. 1. *Trochodendron*. Diagrammatic drawing of an inflorescence. FIG. 2. *Tetracentron*. Diagrammatic drawing of an opening floral bud on a short shoot; internodes elongated. FIG. 3. *Tetracentron*. Diagram of floral bud. FIG. 4. *Tetracentron*. Flower, approx. $\times 26$. FIG. 5. *Tetracentron*. Fruit, approx. $\times 29$. FIG. 6. *Trochodendron*. Fruit, approx. $\times 7$.

PLATE II

A., vascular strands in dorsal bulge; *br.*, bract; *cor. b.*, cortical bundle; *d. b.*, dorsal bundle; *d. t.*, dorsal trace; *fil.*, filament of stamen; *l. d. b.*, lateral-dorsal bundle; *ov. t.*, ovulatory trace; *st. cu.*, staminal cushion; *st. sc.*, staminal scar; *st. t.*, staminal trace; *v. b.*, ventral bundle; *v. t.*, ventral trace.

FIG. 7. *Trochodendron*. Flower; two carpels removed at level *A* and two removed at level *B* to show cross sectional view; perpendicular shading lines indicate cut surfaces; epidermal surface represented by stippling; only half of dorsal vascular system shown in one carpel; approx. $\times 18$.

PLATE III

A., vascular strands in dorsal bulge; *cor. b.*, cortical bundle; *d. b.*, dorsal bundle; *d. blg.*, dorsal bulge; *d. l. b.*, dorsal-lateral bundle; *d. l. t.*, dorsal-lateral trace; *d. t.*, dorsal trace; *l. se. b.*, lateral sepal trace; *ov. t.*, ovulatory trace; *se.*, sepal; *se. t.*, sepal trace; *st.*, stamen; *st. t.*, stamen trace; *v. t.*, ventral trace.

FIG. 8. *Trochodendron*. Transverse section of flower from region comparable to level *B* in Fig. 7, $\times 12$. FIG. 9. The same. Transverse section through placentae, $\times 12$. FIG. 10. The same. Transverse section through styles, $\times 12$. FIGS. 11–13. *Tetracentron*. Transverse sections through flower comparable to sections in Figs. 8–10, approx. $\times 31$.

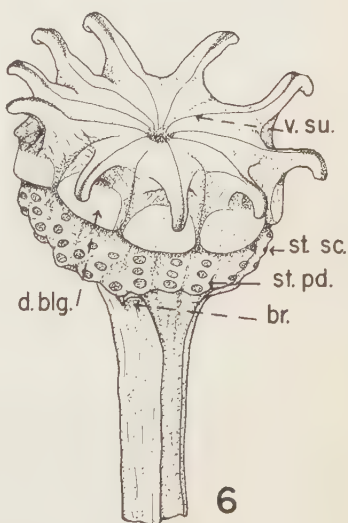
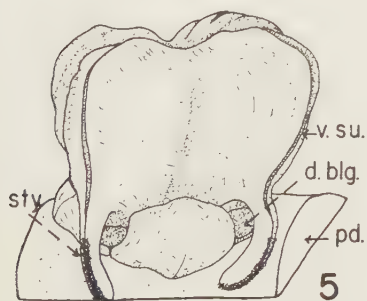
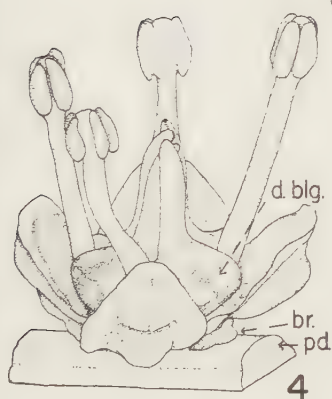
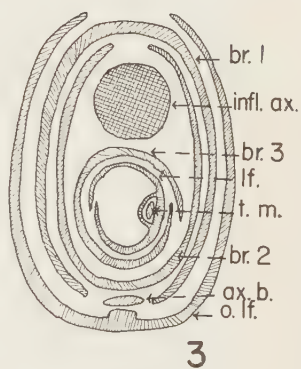
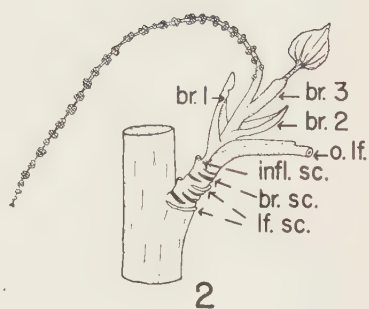
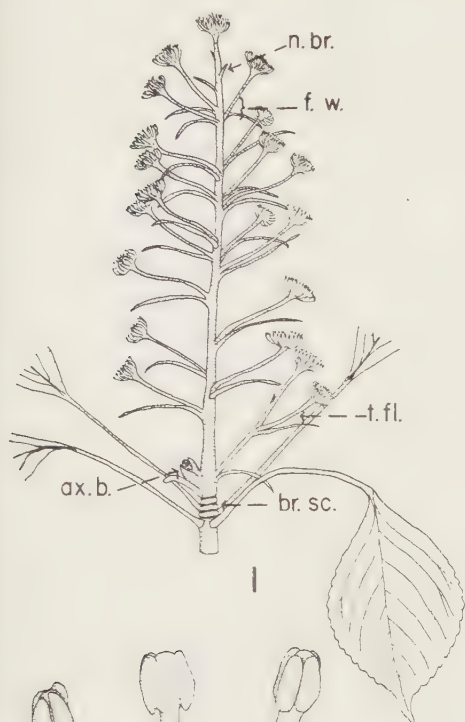
PLATE IV

Em., embryo; *end.*, endosperm; *fu.*, funiculus; *i. int.*, inner integument; *mi.*, micropyle; *o. int.*, outer integument; *ov. b.*, ovulatory bundle; *ra.*, raphe; *sc. l.*, sclerenchymatous layer.

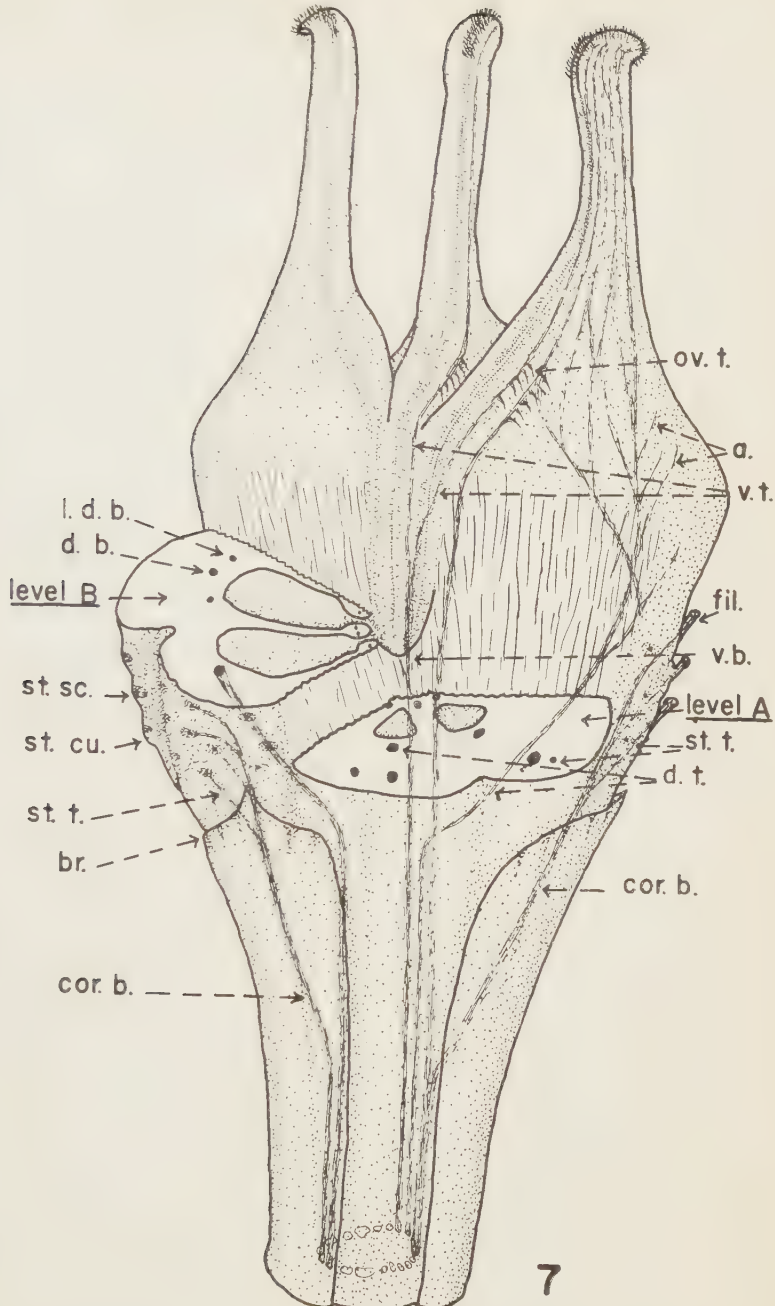
FIG. 14. *Tetracentron*. Young ovule, approx. $\times 114$. FIG. 15. *Trochodendron*. Young ovule, approx. $\times 76$. FIG. 16. *Tetracentron*. Fertile seed cleared in NaOH, approx. $\times 24$. FIG. 17. *Trochodendron*. Fertile seed cleared in NaOH, approx. $\times 24$. FIG. 18. *Tetracentron*. Transverse section through middle of fertile seed, approx. $\times 8\frac{1}{2}$. FIG. 19. *Trochodendron*. Transverse section through middle of fertile seed, approx. $\times 8\frac{1}{2}$. FIG. 20. *Tetracentron*. Longitudinal section of micropylar end of fertile seed, approx. $\times 8\frac{1}{2}$. FIG. 21. *Trochodendron*. Transverse section through middle of sterile seed, approx. $\times 8\frac{1}{2}$. FIG. 21a. *Trochodendron*. Transverse section through outer seed coat and sclerenchymatous layer of fertile seed, approx. $\times 764$.

PLATE V

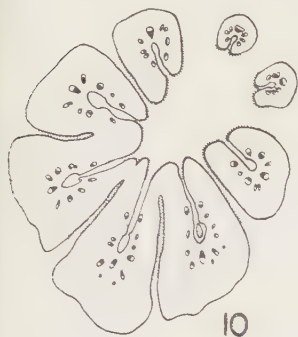
FIG. 22. *Trochodendron*. Transverse section through anther, $\times 126$. FIG. 23. *Tetracentron*. Transverse section through anther, $\times 103$. FIG. 24. *Trochodendron*. Pollen grain, *pap.*, papillae; *rid.*, ridges of reticulation, $\times 1390$. FIG. 25. *Tetracentron*. Pollen grain, $\times 1390$. FIG. 26. *Trochodendron*. Section of pollen grain showing structure of wall, approx. $\times 1675$. FIG. 27. *Disanthus cercidifolius* Maxim. Pollen grain, $\times 1390$.



MORPHOLOGY OF TROCHODENDRON AND TETRACENTRON



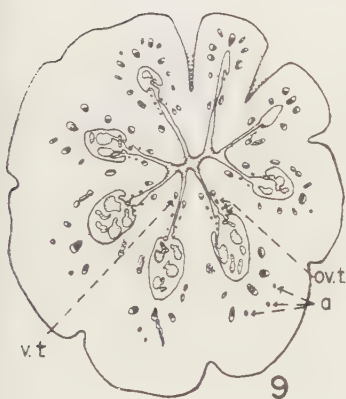
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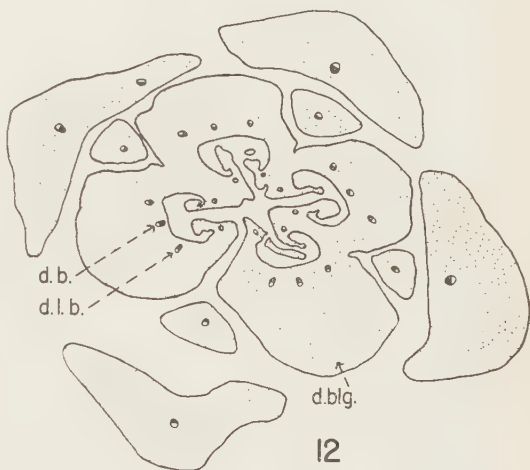
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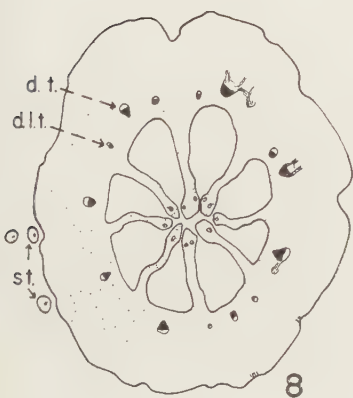
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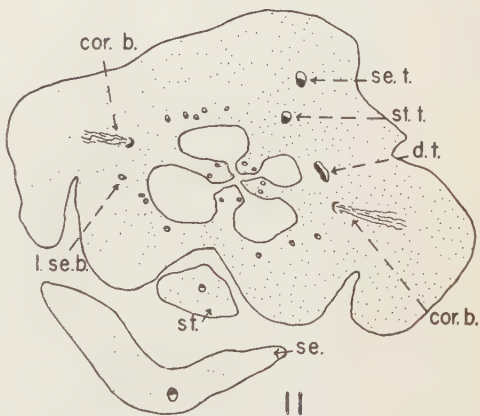
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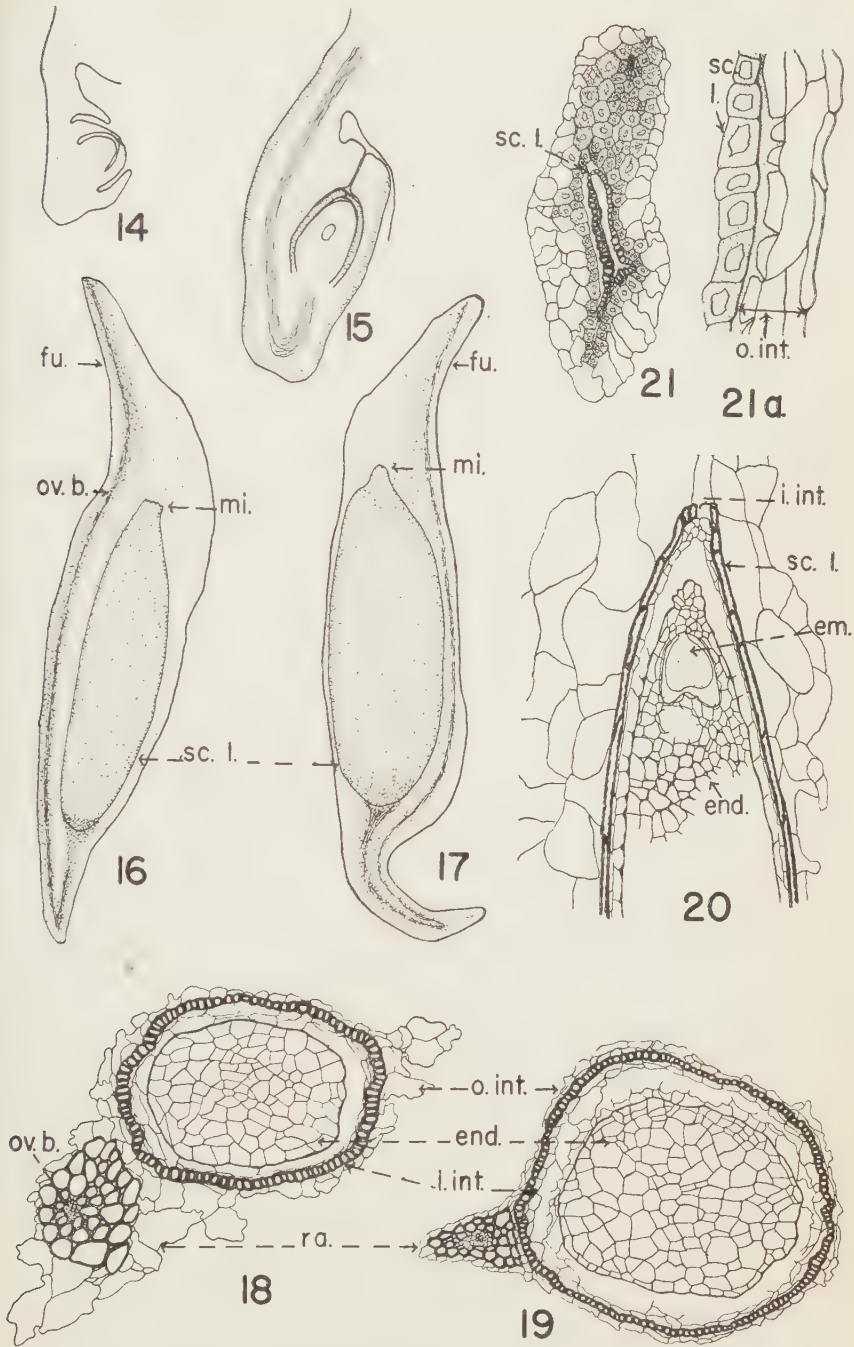


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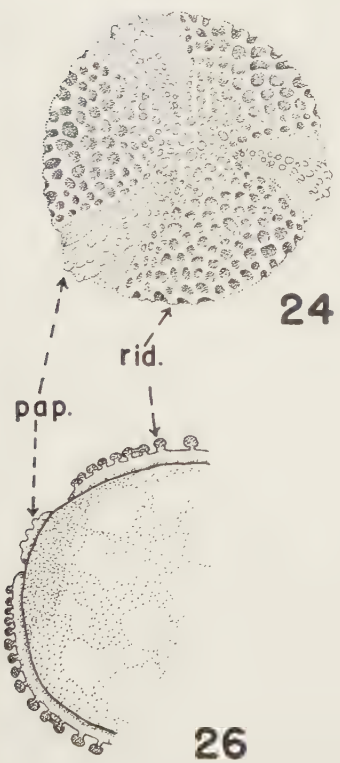
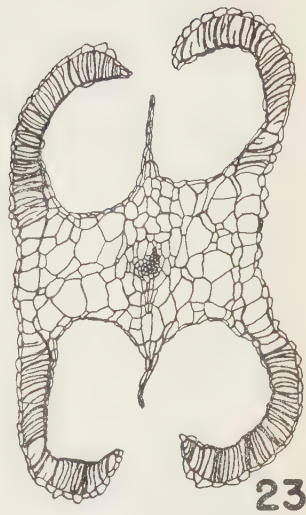
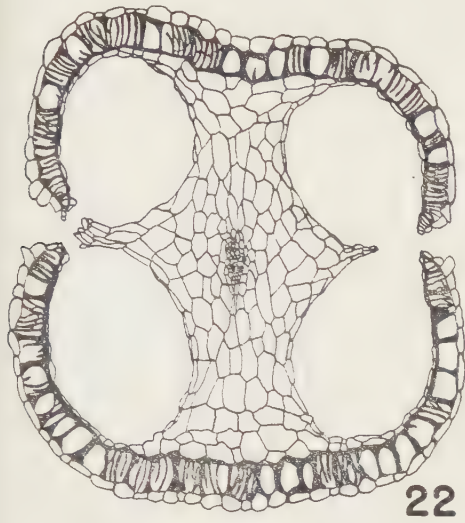
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MORPHOLOGY OF TROCHODENDRON AND TETRACENTRON





MORPHOLOGY OF TROCHODENDRON AND TETRACENTRON



MORACEAE. HIPPOCASTANACEAE ET VITACEAE. NOMINA CONSERVANDA

ALFRED REHDER

COMPARATIVELY little attention has been paid to names of families and their validity under the International Rules of Botanical Nomenclature. The only proposal for the conservation of names of families is the list of 186 names proposed by J. Lanjouw and T. A. Sprague on pp. 64-65 of the Synopsis of Proposals concerning Nomenclature prepared by T. A. Sprague and submitted to the Sixth International Botanical Congress at Amsterdam in 1935. This list was voted upon at the Congress and adopted without change (see Proc. Sixth Intern. Bot. Congr. 1: 358, 1936). The list, however, contains only names employed by Bentham and Hooker f., *Genera Plantarum*, and also some by Engler & Gilg, *Syllabus der Pflanzenfamilien* (ed. 9 & 10), formed according to Art. 23 of the Rules and the few exceptions conserved under Art. 23, Exceptions (1) and (3). The conservation of additional names was left by the last Botanical Congress to the Special Committee for Phanerogamae and Pteridophyta (see op. cit. 358, 381).

The three names proposed here for conservation are not included in the list referred to above, as they were not used by Bentham and Hooker, but they have been generally accepted by most recent authors, including Engler & Gilg, and they would be the correct names for the three families if each of them were not antedated by an older validly published and correctly formed name. Like these three, a number of other family names proposed by Horaninov have been entirely overlooked and have been credited to later authors, as Myricaceae, Juglandaceae, Calycanthaceae, Loganiaceae, Scrophulariaceae, and others.

Moraceae Lindley, Veg. Kingd. 266 (1846), sensu stricto. — Bureau in De Candolle, Prodr. 17: 211 (1873), sensu stricto. — Engler in Nat. Pflanzenfam. III. 1: 66 (1889). — Nakai, Fl. Sylv. Kor. 19: 90 (1933), with many synonyms. — Nomen conservandum

versus

Artocarpaceae Horaninov, Prim. Lin. Syst. Nat. 62 (1834). — Lindley, Veg. Kingd. 269 (1846), sensu stricto. — Bureau in De Candolle, Prodr. 17: 280 (1873), sensu stricto.

Urticeae ord. II. **Artocarpeae** De Candolle in Lamarck & De Candolle, Fl. Franç. ed. 3, 3: 318 (1805).

Urticeae Agardh, Aphor. Bot. 203 (1825), p. p.

Moreae Endlicher, Prodr. Fl. Norfolk. 40 (1833), nom.; Gen. Pl. 277 (1836).

Urticaceae 1. **Artocarpeae** Reichenbach, Handb. Nat. Pflanzensyst. 172 (1837), nom. subnud.

Urticaceae subord. **Moreae** Gray, Bot. Text-book, 356 (1842).

Urticaceae subfam. **Ficeae** Presl, Wšeb. Rostl. 2: 1365 (1846).

Moraceae subfam. **Moroideae** et **Artocarpoideae** A. Braun in Ascherson, Fl. Prov. Brandenb. 1: 57 (1864).

As the name *Moraceae* has been used by all authors who considered the family distinct from *Urticaceae*, it seems advisable to conserve it for that important family, which includes a number of genera of great economic importance. The name *Artocarpaceae* Horan. (emend.) would then be valid only as the name of a separate family distinct from *Moraceae*, as used by Lindley in 1846 and by Bureau in 1873; in his original concept Horaninov used the name in a wider sense, including *Morus* and related genera.

Hippocastanaceae Torrey & Gray, Fl. N. Am. 1: 250 (1838). — Pax in Nat. Pflanzenfam. III. 5: 273 (1895). — Nomen conservandum
versus
Paviaceae Horaninov, Prim. Lin. Syst. Nat. 100 (1834).

Sapindaceae Jussieu in Ann. Mus. Hist. Nat. Paris, 18: 476 (1811), p. p.

Hippocastaneae De Candolle [Théor. Élém. Bot., ed. 2, 44 (1819) "*Hippocastanées*"; Prodr. 1: 597 (1824)].

Castaneaceae Link, Enum. Pl. Hort. Berol. 1: 354 (1821), nom. subnud.; a name apparently based on *Castanea*, though not in the sense of Miller; it is not cited by Link as one of the constituent genera.

Sapindaceae 3. *Sapindeae* a. *Hippocastaneae* Reichenbach, Handb. Nat. Pflanzensyst. 285 (1837).

Aesculeae Presl (1820) ex Presl, Wseob. Rostl. 1: 217 (1846).

Sapindaceae trib. *Paviariae* Horaninov, Char. Ess. Fam. Reg. Veg. 182 (1847).

Sapindaceae subord. *Sapindeae* Bentham & Hooker f., Gen. Pl. 1: 389 (1862), p. p.

Sapindaceae subfam. *Hippocastanoideae* A. Braun in Ascherson, Fl. Prov. Brandenb. 1: 53 (1864).

Sapindaceae 2. *Hippocastanae* Drude in A. Schenk, Handb. Bot. 3, 2: 390 (1887).

As the name *Hippocastanaceae* has been used since 1838 by all authors who considered the family distinct from *Sapindaceae*, and as the name *Paviaceae*, though validly published by Horaninov in 1834, has never been taken up, as far as I know, by any author, it seems advisable to conserve the name *Hippocastanaceae* for this well known, though small family, of ornamental trees and shrubs widely planted throughout the temperate zone.

Vitaceae Lindley, Nat. Syst. Bot., ed. 2, 30 (1836). — Gilg in Nat. Pflanzenfam. III. 5: 427 (1896). — Nomen conservandum
versus

Leeaceae Horaninov, Prim. Lin. Syst. Nat. 95 (1834).

Vites Jussieu, Gen. Pl. 267 (1798). — Lindley, Introd. Nat. Syst. Bot. 119 (1830).

Sarmentaceae Ventenat, Tabl. Règ. Vég. 3: 167 (1799).

Viniferae Jussieu in Mém. Mus. Hist. Nat. Paris, 3: 444 (1817).

Ampelideae Humboldt, Bonpland & Kunth, Nov. Gen. 5: 223 (fol. ed. p. 172) (1821). — De Candolle, Prodr. 1: 627 (1824). — Bentham & Hooker f., Gen. Pl. 1: 386 (1862).

Celastraceae . . . *Cisseae* Horaninov, Tetractys Nat. 32 (1843), nom.

Cissaceae Horaninov, Char. Ess. Fam. Reg. Veg. 184 (1847).

Ampelidaceae Lowe, Man. Fl. Madeira, 80 (1868).

As *Vitaceae* is the only name formed according to the Rules which has been generally accepted, while *Leeaceae* has not been taken up by any author and moreover is based on a genus not typical of the family, it seems advisable to conserve the name *Vitaceae*. Horaninov himself abandoned

the name in his two later works, making the group in 1843 under the name Cisseae a subdivision of Celastraceae, and in 1847 raising it as Cissaceae again to the rank of a family.

If one were to follow the proposal made by Sprague in 1922 (in *Jour. Bot.* 60: 69-73), the two last family names discussed would be valid without conservation as Hippocastanaceae (DC.) Torr. & Gray and as Vitaceae (Juss.) Lindl. Sprague brings forward the argument that the priority of a name of a family dates from the first valid publication of a name with any plural ending based on a generic name, even if it consists of the plural form of that generic name. In such cases the change to the ending -aceae is supposed to be an orthographic correction and the original author is to be cited in parentheses. Sprague's proposal, however, conflicts with long-established usage and the very spirit of the Rules. The use of parenthetical authors is specifically restricted by Art. 49 to changes of rank of genera and groups below genera, and of transfers of groups below the genus with or without change of rank, but with no alteration in the name or epithet itself. According to that article, a citation like Hippocastanaceae (DC.) Torr. & Gray could mean only that Torrey & Gray transferred a family named by De Candolle as Hippocastanaceae from one higher group (ordo of Art. 12 and of Recomm. VIII and IX) to another. Hippocastaneae DC. and also Vites Juss. are not valid family names according to Art. 23; they have no standing, and if transferred could have no validity. Orthographic corrections or changes in the spelling of a name do not call for the citation in parentheses of the original author; they should be indicated by citing the original spelling in quotation marks after the citation of the correct name, or in a note beneath it.

In regard to transfers of names of groups above genera (see note on pp. 68 and 78), it would seem to be in the spirit of the Rules to make the citation of the parenthetical author obligatory for transfers of the correct names of subdivisions of families. This could be done by a proposal to insert in the second paragraph of Art. 49 the word "family" before genus, so that the paragraph would read: "The same holds when a subdivision of a family, a genus, a species, or a group of lower rank is transferred to another family, genus or species with or without alteration of rank."

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STUDIES IN THE LAURACEAE, VI*
PRELIMINARY SURVEY OF THE MEXICAN AND
CENTRAL AMERICAN SPECIES

CAROLINE K. ALLEN

THE PRESENT paper was undertaken as groundwork for the presentation of the Lauraceae in the Flora of Panama, which is being published in fascicles by Dr. Robert E. Woodson, Jr., in the Annals of the Missouri Botanical Garden. Dr. A. J. G. H. Kostermans has published in detail on the smaller genera of Lauraceae of this hemisphere. Consequently the present treatment of these genera will not be as detailed as those on which he has not worked. Unfortunately, at the outbreak of World War II Dr. Kostermans had on loan in Utrecht a large number of specimens of Lauraceae from various American herbaria. From the material at hand it is apparent that a great deal of field work on the group is necessary. More complete and better collections from regions heretofore little collected are important in order to supplement data already available and to aid in the solution of distributional problems. In passing, mention should be made of the imperative need of corroborative morphological studies in the group.

In each of the four major genera of the Lauraceae represented in our region, namely *Nectandra*, *Ocotea*, *Persea*, and *Phoebe*, the majority of the species clearly belong to the genera under which they are treated. There are, however, a few species in each genus of which the characters appear to overlap. It is not my belief that these represent new genera, but that the lines between the genera are not as yet very clearly defined. An attempt has been made to evaluate the characters used in delimiting the genera and, where these characters overlap, to place the entity in question in that genus with which it seems to have the greatest number of characters in common. The majority of instances of overlapping occurs among the four genera mentioned. One species of *Ocotea*, however, has double-margined cupules that are typical of *Licaria*, but the flowers are definitely those of *Ocotea*. In the main, the species themselves are clear-cut. On the other hand, there is in each genus at least one entity which appears to be widespread and variable throughout Mexico and Central America. The variations are manifest in the size of the leaves, inflorescences, and flower-parts. Extremes of variation occur seemingly as a result of change in geographical or ecological influences. It should be kept in mind that to date our collections from Mexico and Central America are too scattered to admit of a sweeping reduction of species described from these different areas. In *Litsea glaucescens*, more completely collected than any of the other members of the family, one sees the trend toward a single variable species. The

* For No. V in this series see Jour. Arnold Arb. 23: 444-463. 1942.

situation in *Litsea* nevertheless is hardly typical for other genera in this region. *Litsea* is the only genus which occurs in the arid northern areas of Mexico, south through Central America, and which has no representatives in South America. The genus *Persea* extends north in the same region, in Mexico, but is found in South America. The central portion of Costa Rica seems to have given rise to the largest number of endemic species. Until such time as Mexico and Central America are well represented in herbaria, the presence of few widespread variable species as opposed to several very closely related but separate species is a matter of conjecture. There has been heretofore an almost wholesale linkage of Central American and Colombian entities. Very probably there is a definite and logical connection, but very possibly this connection has been over-worked and is not as common an occurrence as has been supposed. This may be illustrated by the South American species of *Persea* *caerulea* and *Nectandra* *Pichurim*, neither of which occurs in Central America, but both of which have been reported as common to both areas. Again, it is necessary to have available more material than is at hand at present before disposing of these distributional problems with any degree of accuracy. In the course of this study many specimens which are too fragmentary or incomplete for satisfactory description have been set aside until such time as more complete material will be available.

An effort has been made to locate on modern maps as many as possible of the localities cited, and the present spelling has usually been used. Numerous labels of Purpus' plants mention Zacuapán. This is on recent maps clearly Axouacapán. From the latter locality to Cordoba numerous small localities given by Purpus have been located. The collector Austin Smith mentions various zones on his labels. This zoning is not botanical, but ornithological, being determined by the presence or absence of certain key birds. Mention should be made of the term "apparent petiole", which is used to describe the basal part of a leaf-blade which is narrowly decurrent and recurved for so long a distance at its base that the lower portion of the blade seems to form with the midrib an extremely long petiole. The apex of certain fruits frequently dries smooth and is not wrinkled as is the remainder of the surface. This smooth unwrinkled portion sometimes dries in such a way as to split the outer layer of the exocarp, forming a star-shaped pattern. The measurements of the flower-parts were made with the aid of a micrometer device, and some variation in respect to measurement is to be anticipated.

I wish to thank the directors and curators of the following herbaria for their courtesy in lending material for study: Arnold Arboretum (A), Chicago Natural History Museum (Ch), Gray Herbarium (GH), University of Michigan (Mich), Missouri Botanical Garden (Mo), New York Botanical Garden (NY), University of Texas (Tex), United States National Herbarium (US), Yale School of Forestry (Y). The parenthetical letters indicate the place of deposit of the cited specimens. I am particularly indebted to Dr. P. C. Standley, of the Chicago Natural History Museum, for his helpful and careful selection of interesting material from Guatemala.

At this time I should especially like to acknowledge my gratitude to the late Dean S. J. Record, of the Yale School of Forestry, for his kind interest in this study.

KEY TO THE MEXICAN AND CENTRAL AMERICAN GENERA OF LAURACEAE

- A. Foliose trees or shrubs, not parasitic.
 - B. Anthers four-celled.
 - C. Inflorescences variously paniculate, with no involucre.
 - D. Staminodia large, cordate, stipitate.
 - E. Perianth-lobes usually unequal or at most subequal; usually lower cells of the anther touching upper at their sides.....1. *Persea*.
 - E. Perianth-lobes equal; usually lower cells of the anther touching upper at their bases.....2. *Phoebe*.
 - D. Staminodia small, inconspicuous or occasionally lacking.
 - E. Flowers perfect or dioecious; perianth-lobes not reflexed at anthesis, thin in texture; cells of the anthers arranged in two planes, one above the other.....3. *Ocotea*.
 - E. Flowers always perfect; perianth-lobes usually fleshy, papillose and reflexed at anthesis; cells of the anthers arranged in an arc.....4. *Nectandra*.
 - C. Inflorescences racemose or fasciculate, with involucre.....5. *Litsea*.
 - B. Anthers two-celled.
 - C. Flowers dioecious.....9. *Endlicheria*.
 - C. Flowers hermaphrodite.
 - D. Flowers with three fertile stamens; fruits subtended by cupules with double or triple margins.....11. *Licaria*.
 - D. Flowers with nine fertile stamens; fruits subtended by naked pedicels or by cupules with single margins.
 - E. Staminodia very well developed; perianth-lobes deciduous entirely; fruits subtended by naked pedicels.
 - F. Perianth-tube short and shallow; style short, thick, conical, obtuse; stigma almost inconspicuous; perianth-lobes deciduous; fruits seated on scarcely enlarged pedicels.....6. *Beilschmiedia*.
 - F. Perianth-tube conspicuous, slender, urceolate, constricted below lobes; style longer than ovary, thick, conical; stigma small, truncate, discoid, conspicuous; fruits completely surrounded by enlarged thickened perianth-tube with only a minute pore at the apex, crowned by remnants of the perianth-lobes.....10. *Cryptocarya*.
 - E. Staminodia inconspicuous or absent; perianth entirely or in part persistent; fruits subtended by cupules with single margins.
 - F. Stigma well developed, peltate; leaf-blades yellow-green on drying; fruits subtended by fleshy cupule and pedicel.....7. *Aiouea*.
 - F. Stigma minute, hardly conspicuous; leaf-blades not yellow-green on drying; fruits subtended by woody cupule and pedicel.....8. *Aniba*.
 - A. Parasitic herbs, with leaves reduced to scales.....12. *Cassytha*.

1. *Persea* Miller

Persea Miller, Gard. Dict. ed. 8. 1768; Gaertner f., Fruct. & Sem. 3: 222. 1805; H.B.K. Nov. Gen. & Sp. 2: 125 [157]. 1817; Meissner in DC. Prodr. 15¹: 43. 1864; Bentham in Bentham & Hooker f. Gen. Pl. 3: 156. 1880; Hemsley, Biol. Centr. Am. Bot. 3: 71. 1882; Mez in Jahrb. Bot. Gart. Berlin 5: 134. 1889; Kostermans in Meded. Bot. Mus. Utrecht 25: 12. 1936.

DISTRIBUTION: A tropical American genus, with the exception of a single species from the Canary Islands. A few species are native to the United States, from Virginia and the Carolinas south to Florida and Texas, but these species do not occur in Mexico. The West Indian species seem to have nothing in common with other tropical species of the genus. One link which binds all tropical localities is the avocado pear, *Persea americana*, which, as the species proper or in one of its many forms, is to be found cultivated generally throughout the Americas.

Persea is comprised of trees or shrubs with evergreen penninerved leaves which vary in texture from chartaceous to heavily coriaceous and are usually pubescent to some degree. The axillary commonly paniculate inflorescences bear perfect flowers up to 9 mm. long, the customary length for the genus being 4–5 mm. The 3 outer perianth-lobes are generally shorter than the inner and almost always persist in fruit. There are four staminal whorls, the first three of which are usually fertile. The four-celled anthers are borne on slender hairy filaments two or three times as long as the anthers. The cells of the anthers of the first series are introrse, whereas those of the third are extrorse, or the two upper cells may be lateral and the lower extrorse, the filaments being distinctly biglandular near the base. The four cells of the anthers are in two planes, the bases of the two upper cells laterally tangential to the apices of the two lower cells. The staminodia of the fourth cycle are conspicuous, cordate-sagittate, and stipitate, often pubescent throughout, the stipes generally densely so. The ovary is subglobose, pubescent or glabrous, topped by a slender usually pubescent style that is equal to or more than the length of the ovary. The fruit is small and globose or, in the case of the avocado-type, large, fleshy, and obovoid, borne for the most part on the spreading perianth-lobes and pedicels, generally not enlarged as compared with those of the other genera of the Lauraceae. Only occasionally are the perianth-lobes deciduous.

KEY TO THE SPECIES OF PERSEA

- A. Leaf-blades not more than 12 cm. long.
 - B. Lower leaf-surface completely glabrous.
 - C. Lower leaf-surface glaucescent; lateral nerves diverging from the costa at an angle of 35–55°.....1. *P. longipes*.
 - C. Lower leaf-surface not glaucescent; lateral nerves diverging from the costa at an angle of 90° or slightly less.....2. *P. Steyermarkii*.
 - B. Lower leaf-surface not glabrous.
 - C. Leaf-blades ochraceous-sericeous beneath, not more than 7.5 cm. long; lateral nerves diverging from the costa at an angle of about 90°.....3. *P. Brenesii*.
 - C. Leaf-blades ferruginous-tomentose beneath, up to 9 cm. long; lateral nerves diverging from the costa at an angle of 20–45°.....4. *P. pachypoda*.
- A. Leaf-blades not less than 12.5 cm. long.
 - B. Leaf-blades never sessile and subcordate.
 - C. Ovary pubescent.
 - D. Leaves anise-scented, with long petioles one-half the length of the thin elliptic blades; perianth persistent or subsistent.....5a. *P. americana* var. *drymifolia*.
 - D. Leaves not anise-scented, with petioles not more than one-quarter the length of the chartaceous or coriaceous blades, varying from elliptic to ovate.

- E. Inflorescence, young branchlets, and lower leaf-surface not densely golden-brown-sericeous.
 - F. Branchlets yellow-tomentellous, becoming glabrous or subglabrous; lower leaf-surface subglaucous; lateral nerves 4-14 pairs; blades variable, usually elliptic, up to 10.5 cm. broad, acuminate; fruits variable in shape.....5. *P. americana*.
 - F. Branchlets and lower leaf-surface densely brown-tomentose; lateral nerves 8-15 pairs; leaf-blades irregularly elliptic or obovate-elliptic, up to 10-15 cm. broad, obtuse or abruptly acuminate; fruits obovoid (slender and bottle-necked).....6. *P. Schiedeana*.
 - F. Branchlets fulvo-pubescent, becoming glabrous; leaves glaucescent beneath and floccose-tomentose; lateral nerves 7 or 8 pairs; blades ovate, acuminate, up to 7.5 (-8) cm. broad; fruits depressed-globose(?).....7. *P. floccosa*.
 - E. Inflorescence, young branchlets, and lower leaf-surface densely golden-brown-sericeous.....8. *P. flavifolia*.
- C. Ovary glabrous.
 - D. Inflorescence loosely paniculate or loosely subcorymbose.
 - E. Leaf-blades sometimes obovate or elliptic or broadly round-elliptic.
 - F. Inflorescence not less than 8 (usually 10-12) cm. long; largest leaf-blades usually at least 10, occasionally 15 cm. broad.....9. *P. Donnell-Smithii*.
 - F. Inflorescence not more than 7 cm. long; largest leaf-blades not more than 8 cm. broad.
 - G. Leaf-blades 9-13 \times 3.2-7 cm.; lateral nerves up to 8 pairs; fruits black.....10. *P. Chamissonis*.
 - G. Leaf-blades 10-20 \times 5-8 cm.; lateral nerves 14-16 pairs; fruits glaucous-blue.....11. *P. cinerascens*.
 - E. Leaf-blades never obovate.
 - F. Branchlets, lower leaf-surface, and inflorescence densely ferruginous-tomentose.....9. *P. Donnell-Smithii*.
 - F. Branchlets, lower leaf-surface, and inflorescence not densely ferruginous-tomentose.
 - G. Leaf-blades rigidly coriaceous or chartaceous; inflorescences numerous and more or less corymbose, densely pubescent.
 - H. Perianth-lobes decidedly unequal.
 - I. Lower leaf-surface and inflorescence subsericeous; petioles up to 4.5 cm. long; leaf-blades not more than 10.5 cm. broad; fruits 7 mm. diam., subtended by remnants of scarcely thickened perianth-lobes..12. *P. Liebmanni*.
 - I. Lower leaf-surface and inflorescence shortly tomentellous; petioles up to 2 cm. long; leaf-blades not more than 6.5 cm. broad; fruits at least up to 3.5 cm. diam., subtended by a thickened subcampanulate cupule.....13. *P. vesticula*.
 - H. Perianth-lobes equal or subequal.
 - I. Largest leaf-blades not more than 15 cm. long, glaucescent beneath; petioles up to 2 cm. long; branchlets yellowish-pubescent to glabrous; inflorescence equal to or slightly shorter than the leaves.....14. *P. pallida*.
 - I. Largest leaf-blades up to 33 cm. long, not glaucescent beneath; petioles not more than 1.5 cm. long; branchlets glabrous; inflorescence much shorter than leaves.....15. *P. rigens*.
 - G. Leaves pergamentaceous; inflorescences not numerous and corymbose but spreading-paniculate, fulvo-sericeous.....16. *P. Skutchii*.

- D. Inflorescence with compact shortly branched panicles more or less compressed into a subpyramidal or subcapitate structure at the tips of the peduncles.
- E. Lower leaf-surface densely pubescent; blades of largest leaves not less than 6, usually 8 cm. broad.
- F. Lower leaf-surface flavo-sericeous; petioles to 4.5 cm. long; inflorescence flavo-sericeous, not more than 6 cm. long (rarely 7 cm.).....8. *P. flavifolia*.
- F. Lower leaf-surface whitish or flavo-tomentose, not sericeous; petioles to 3.5 cm. long; inflorescence whitish- or flavo-tomentose, up to 10 cm. long.....17. *P. Hintonii*.
- E. Lower leaf-surface glabrous or glabrescent (or sericeous to glabrescent), glaucescent beneath; blades of largest leaves not more than 5.5 cm. broad.
- F. Leaf-blades elliptic, shortly acuminate or acute, not more than 15×5 (occasionally 8) cm.; lateral nerves 6-10 pairs.
- G. Leaf-blades glabrous, the margin undulate, the lower surface subglaucous; lateral nerves 6-8 pairs; inflorescence not more than 6 cm. long; fruits blackish, seated on the remnants of partially deciduous perianth-lobes.....1. *P. longipes*.
- G. Leaf-blades sericeous to glabrescent, glaucescent beneath; lateral nerves 8-10 pairs; inflorescence up to 10 cm. long; fruits with bluish bloom, seated on the patent persistent perianth-lobes.....18. *P. veraguasensis*.
- F. Leaf-blades lanceolate-elliptic, subobtusate, subacute to acuminate, not more than 4.5 cm. broad; lateral nerves 10-14 pairs.
- G. Petioles not more than 2 cm. long; lateral nerves up to 14 pairs, usually obscure beneath; reticulation if present very inconspicuous.....19. *P. podadenia*.
- G. Petioles up to 3.5 cm. long; lateral nerves 10-12 pairs and fairly conspicuous above, very much so beneath; reticulation conspicuous, particularly beneath.....20. *P. Standleyi*.
- B. Leaf-blades sessile and subcordate.....21. *P. sessilis*.

1. *Persea longipes* (Schlechtendal) Meissner in DC. Prodr. 15¹: 55. 1864; Standley in Contr. U. S. Nat. Herb. 23: 291. 1922.

Laurus longipes Schlechtendal in Linnaea 7: 390. 1832.

DISTRIBUTION: Known only from Vera Cruz, Mexico.

MEXICO: Vera Cruz(?): Hacienda de la Laguna, Schiede 59 (fr., photo. of TYPE, Ch, NY). Vera Cruz: Mirador, 3/1842, Liebmann Lauraceae 72 (fl., Ch), 756 ? (fl., Ch).

The Liebmann numbers last cited bear the determination *P. brevipes*, but since the number 72 is cited by Mez in his monograph under *P. longipes* and agrees with the description, it is safe to assume that the name on the label is erroneous. The flowering specimens cited show densely crowded leafy branchlets blackish brown and striate, with long (up to 3.3 cm.) gracefully petioled leaves (2.5-10 [-13] cm. \times 1.5-5.5 cm.) chartaceous and glabrous, the midrib impressed above and the lateral nerves obscure, the surface somewhat areolate. The midrib and nerves are slightly more prominent beneath, being brownish against the subglaucous lower leaf-surface. The inconspicuous lateral nerves, 6-8 pairs, usually diverge at an angle of 45°, but vary from 35-55°. The short rather few-flowered panicles (6 cm. long) are narrow, subtended by glabrous dark brown slender peduncles up to 4 cm. long. The flowers are ferruginous-sericeous with the inner lobes of the perianth twice as long as the outer. The

stamens of the outer series are ± 2.4 mm. long, the pubescent filaments equalling in length the ovate rounded anthers, with the two upper cells smaller than the lower. Those of the inner series are ± 2.6 mm. long, the filaments biglandular, the anthers narrower. The staminodia are ± 1.25 mm. long, broadly cordate, borne on pubescent stipes one-half the entire length. The glabrous gynaecium is up to 3 mm. long, and the subglobose ovary is about one-third the length of the entire gynaecium. The slender style is topped by a small inconspicuous discoid stigma.

The nearest relatives of this species seem to be the Mexican *P. podadenia*, the palish leaf-blades of which are more regularly elliptic or oblong-elliptic, $6-15 \times 2-4$ cm., with petiole up to 2 cm. long and with 14 pairs of lateral nerves, and the Costa Rican and Panamanian species *P. veraguasensis*. From the former it is readily separated by the broadly and irregularly elliptic leaf-blades with undulate margins, $2.5-10 (-13) \times 1.5-6.5$ cm., with petiole up to 3.3 cm. long and with 6-8 pairs of lateral nerves. From the latter species it is separated by the leaf-blades of more uniform shape, not undulate at the margin, very glaucous and lightly pubescent on the lower leaf-surface, with usually more than 8 pairs of lateral nerves, the dark venation being very conspicuous. The branchlets are covered with a slight puberulence, and the inflorescence is densely clothed with a subferruginous somewhat sericeous pubescence. The blackish (fide Meissner) fruits of *P. longipes*, to judge from the photograph of the type, are subtended by the remnants of the perianth-lobes, the tips of which have broken off, rather roughly and irregularly, showing only the line of decurrence on the tube—a characteristic in common with *P. podadenia*. The bluish glaucous fruits of *P. veraguasensis*, on the other hand, are subtended by the somewhat enlarged remains of the persistent pubescent perianth-lobes, which are always patent and often slightly reflexed.

2. *Persea Steyermarkii*, sp. nov.

Arbor parva ad 10.5 m. alta, ramulis apice dense foliosis glabris atro-rubrescentibus striatis mox griseis rugosulis vadose sulcatis. Folia alternata, petiolis atro-rubrescentibus glabris striatis canaliculatis ad 2 cm. longis et 1 mm. vel minus latis, laminis utrinque glabris coriaceis in sicco supra viridescenti-brunneis, subtus pallidis (caeruleo-argenteis fide coll.), lanceolato-ellipticis vel oblongo-ellipticis, $6.2-10.5$ cm. longis et $2.5-4$ cm. latis, basi obtusis, apice rotundatis vel acutis saepe emarginatis, penninerviis, costa supra satis impressa subtus valde elevata, nervis 6- vel 7-paribus nonnihil obscuris pallidis supra leviter impressis subtus leviter elevatis angulo ad 80° divergentibus, rete venularum utrinque conspicuo. Inflorescentia axillaris (foliis deciduis) foliis brevior subverticillata, paniculata, $3-4(-5)$ cm. longa, pauciflora, pedunculo rubescente glabrescente striato gracili ad 3 cm. longo. Flores ad $5.5-8$ mm. longi, pedicellis minute gracilibus adpresse pubescentibus ad $7-10$ mm. longis, perianthio campanulato flavo-viridescente fragrante fide coll., lobis reflexis nonnihil crassis leviter papillosis exterioribus ± 4.5 mm. longis interioribus ± 6 mm. longis; staminibus loculis superioribus quam inferioribus brevioribus ± 4.25 mm. longis, antheris truncato-ovatis longitudine subdimidio staminum aequantibus filamentis pubescentibus; staminibus ser. III antheris emarginatis, biglandulosis, glandulis conspicuis reniformibus stipitatis,

antheris subaequalibus; staminodiis conspicuis, \pm 3.5 mm. longis cordatis stipitatis, stipite pubescente crasso; gynaeceo pubescente \pm 4.25 mm. longo, ovario late ovoideo vel subgloboso, stylo leviter quam ovario longiore, stigmatibus subcapitato conspicuo. Fructus ignotus.

DISTRIBUTION: Known only from type-locality.

GUATEMALA: San Marcos: Trail between Finca El Porvenir and San Sebastian, upper slopes of Volcán Tajumulco, alt. 1300–1400 m., March 1, 1940, *Steyermark 37061* (fl., TYPE, Ch) (small tree 9–10.5 m.; leaves ascending, erect, coriaceous, pale or olive-green above, blue-silvery-green beneath with depressions between lateral veins, the margins revolute; flowers sweet-scented, the petals yellow-greenish, the pedicels pale green, the anthers deep yellow).

This species, with branchlets densely foliose at the apex, seems to have no particular affinity. Its floral characters seem to be near those of *P. americana* and its relatives, but the general habit indicates perhaps a relationship to the species *P. longipes* and *P. Standleyi*.

3. *Persea Brenesii* Standley in Field Mus. Publ. Bot. 18: 458. 1937.

DISTRIBUTION: Forests or pastures of Costa Rica, known only from the type-locality.

COSTA RICA: Alajuela: La Palma de San Ramón, alt. 1150 m., *Brenes 4451* (fl., TYPE not seen).

This species is one of the smallest-leaved species of *Persea*. The most salient features seem to be the dense ochraceous-sericeous pubescence found on the leafy thick angled branchlets, the petioles 10–14 mm. long, and the lower surface of the small (5.5–7.5 \times 1.5–2.5 cm.) obtuse or acutish oblong leaf-blades glabrous above with the costa and nerves slightly impressed and elevated beneath. The lateral nerves are about 6 pairs diverging from the costa at right angles or more narrowly ascending. The inflorescences are axillary few-flowered corymbs slightly longer than the leaves and densely ochraceous-sericeous, with flowers sessile or shortly and thickly pedicellate. The inner oblong-ovate obtuse almost 5 mm. long lobes of the perianth are longer than the oval or ovate exterior lobes. The fruits, apparently immature, are globose, glabrous, and measure 1 cm. in diameter.

The description seems to place the species in the vicinity of *Persea pachypoda*, from Mexico, if it is not actually conspecific with it. The type cannot be located at present.

4. *Persea pachypoda* Nees in Linnaea 21: 490. 1848.

Oreodaphne Benthamiana Nees in Linnaea 21: 521. 1848.

Phoebe Hartwegii Meissner in DC. Prodr. 15¹: 30. 1864.

Persea Hartwegii Hemsley, Biol. Centr. Am. Bot. 3: 72. 1882.

Phoebe Benthamiana Mez in Jahrb. Bot. Gart. Berlin 5: 195. 1889.

Phoebe pachypoda Mez in Jahrb. Bot. Gart. Berlin 5: 196. 1889; Standley in Contr.

U. S. Nat. Herb. 23: 294. 1922.

DISTRIBUTION: Mexico.

MEXICO: ? "Bei el bruco, *Ehrenberg 942*, Arbor, fructu eduli, Apugato cimarron incolis." (fr., fragm. of TYPE of *Persea pachypoda*, Ch). Guanajuato: *Hartweg 84* (fl., fragm. of type of *Oreodaphne Benthamiana*, and syntype of *Phoebe Hartwegii*, NY). San Luis Potosí: Minas de San Rafael, Bagre, June 1911, *Purpus 5338*, 5457 (fl., Ch).

NATIVE NAMES: "Aguacate cimarrón," "Apugato cimarrón" (Mexico).

This small-leaved species has apical branchlets covered with a dense

pale ferruginous tomentum, later becoming fuscous and black. The oblong or oblong-lanceolate acutish or round-apiculate leaf-blades are coriaceous, cuneate at the base, and measure $9.5 \times 3(-5)$ cm. They are densely ferruginous-tomentose throughout, becoming less so with age, with a tomentose petiole up to 2 cm. long. The 4-6 pairs of lateral nerves are rather obscure although slightly elevated above, but, like the costa, are prominently elevated beneath, and diverge from the costa at an angle of between 20 and 30 (-45)°. The short densely ferruginous-tomentose axillary inflorescence, up to 6.5 cm. long, consists of several depauperate panicles which are shortly branched and almost corymbose, borne on long peduncles up to 4 cm. in length. The densely tomentose flowers are about 6 mm. long, subsessile or borne on pedicels slightly more than 1 mm. long. The outer perianth-lobes are ovate and acuminate, with 5 prominent veins, ± 3.5 mm. long, and the inner are rather elliptic, acute, and ± 5 mm. long. The two inner series of stamens are ± 3 mm. long, the pubescent filaments being slightly longer than the apiculate anthers. The stamens of the third series are biglandular and measure ± 4 mm., the stipitate subreniform glands nearly equalling the anthers. The staminodia are stipitate, ± 1.5 mm. long in their entirety, ovate, cordate, and about one-half again as long as the rather stout pubescent stipes. The gynaecium is glabrous and measures ± 4 mm., is ellipsoid, and almost as long as the slender style, which is topped by a conspicuous subpeltate stigma.

As has been noted under *P. Brenesii*, the nearest connection seems to be with that species.

5. *Persea americana* Miller, Gard. Dict. ed. 8. 1768; Blake in Jour. Wash. Acad. Sci. 10: 12, fig. 1, A. 1920; Standley in Contr. U. S. Nat. Herb. 23: 290. 1922; Standley & Calderón, Lista Prelim. Pl. Salvador 85. 1925; Standley in Contr. U. S. Nat. Herb. 27: 183. 1928, in Trop. Woods 21: 17. 1930, in Field Mus. Publ. Bot. 10: 201. 1931; Skutch in Torreya 32: 85-94, figs. 1, 2. 1932; Standley & Record in Field Mus. Publ. Bot. 12: 144. 1936; Standley in Field Mus. Publ. Bot. 18: 457. 1937.

Laurus persea Linnaeus, Sp. Pl. 370. 1753.

Persea gratissima Gaertner f., Fruct. & Sem. 3: 222, pl. 221. 1805.

Persea edulis Rafinesque, Sylva Tellur. 134. 1838.

Persea gratissima var. α *vulgaris* Meissner in DC. Prodr. 15¹: 53. 1864.

Persea gratissima var. γ *macrophylla* Meissner, l.c.

Persea gratissima var. β *oblonga* Meissner, l.c.

Persea persea Cockerell in Bull. Torrey Bot. Club 19: 95. 1892.

Persea amplifolia Mez ? sensu Record in Trop. Woods 10: 21. 1927; Standley in Trop. Woods 21: 17. 1930; non Standley & Calderón, 1925.

DISTRIBUTION: Native probably of Mexico and Central America, and possibly the West Indies; now planted profusely throughout these regions and all tropical and sub-tropical countries

NATIVE NAMES: "Aguacate" (general term throughout Central America, of Aztec origin); "Ahuacate," "Avocado," "Aguacate oloroso" (Vera Cruz, Oaxaca); "On" (Yucatan Maya); "Aguacate xinene," "Xinene" (Oaxaca); "Tonalahuat" (Morelos, Vera Cruz); "Aguacatillo" (Michoacán, Jalisco). Many other names are reported by Standley (1928) as being common in South America where the species is cultivated. He also gives numerous Indian names (1937).

This widely cultivated tree of the tropics is outstanding for its ovate-oblong or obovate-oblong coriaceous dark green leaves, 10-20 cm. long and 3-10 cm. broad, crowded at the branchlet-tips, slightly shining above and

dull glaucous beneath, pubescent to glabrous throughout with yellow venation prominent beneath, subtended by long (1.5–5 cm.) petioles, yellow or yellow-green, pubescent, becoming glabrous. The axillary subterminal inflorescences are paniculate, many-flowered, densely and shortly pubescent, bracteate, the pubescent bracts shortly tomentose and fugacious. The small (0.5–1.5 cm. diam.) flower is borne on a yellowish green pedicel, densely and shortly tomentose and up to 0.5 cm. long. The lobes of the perianth are yellowish green or light yellow, densely silky-tomentose within and without, rarely glabrescent, persistent, 3–6 mm. long and 2–3 mm. wide. The outer lobes are shorter and more narrow than the ovate-oblong or lanceolate inner lobes. The stamens of the two outer series have ovoid or ovoid-oblong acuminate or narrowed and obtuse anthers that are introrse; the flat pilose filaments are 2.5–3.5 mm. long. Those of the inner series are longer, with extrorse anthers, and the filaments bear at the base two short-stiped ovoid glands. The staminodia are short-stiped. The pubescent gynaecium, 4–5.5 mm. long, consists of an ovoid ovary bearing a filiform style topped by a discoid stigma. The large usually oblique globose or pear-shaped edible fruits are yellowish green or tinged with purple when ripe, shining, glabrous, 7–20 cm. long and 7–10 cm. in diameter. The rind is shining and coriaceous; the flesh is thick, oily, pulpy, sweetish to taste, about 1.5–2 cm. thick.

5a. *Persea americana* var. *drymifolia* (Schlechtendal & Chamisso) Blake in Jour. Wash. Acad. Sci. 10: 15. 1920; Standley in Contr. U. S. Nat. Herb. 23: 291. 1922; Standley & Calderón, Lista Prelim. Pl. Salvador 85. 1925.

Persea drymifolia Schlechtendal & Chamisso in Linnaea 6: 365. 1831; Meissner in DC. Prodr. 15¹: 53. 1864; Trabut in Rev. Hort. 1908: 296, fig. 110. 1908.

DISTRIBUTION: Mexico, known only from the type-locality.

MEXICO: Vera Cruz: Papantla, March, Schiede & Deppe 1140 (fl., ISOTYPE of *P. drymifolia*, Mo).

NATIVE NAMES: "Aguacate oloroso" (Mexico).

This variety of *P. americana* from Mexico has smaller leaves and fruits, the leaves giving forth the odor of anise when crushed. The fruit is supported by persistent or somewhat persistent perianth-lobes, a character which Blake mentions as differing from that of *P. americana*. The true avocado, on the other hand, according to Mez' description, has "lobes persistent or subdeciduous."

In the case of *P. americana* and allied species and varieties, further work in the field is necessary for a comprehension of the variability that most certainly abounds in the group. This seems to be particularly true where cultivation has occurred.

The branchlets are blackish, angular-striate, and becoming glabrescent. The leaves are alternate or subopposite, with long slender glabrous petioles 1–2 (–3) cm. long and 1 mm. in diameter, slightly canaliculate. The blades are elliptic, acute or acuminate, with cuneate or sometimes somewhat obtuse base; they measure 6–12 (–15) cm. long and 2–4.5 (–5.7) cm. broad, are pergamentaceous, in the dried state above greenish brown and glabrous, beneath glaucous and scattered-pilose. The costa above is impressed and glabrous, beneath elevated and brownish with slight pilosity. The lateral nerves vary from 6 to 9, not always in opposite pairs, and are obscure above and slightly elevated and brownish-pilose beneath. They diverge from

the costa at an angle of about 45° . The reticulation is indistinct and loose throughout. The subterminal inflorescence is lightly clothed with a fulvous pubescence and is shorter than the leaves, measuring up to 9 cm. in length, with a peduncle 2–4 cm. long. The pubescent flower is borne on a slender pedicel up to 6 mm. long, and the subequal everywhere pubescent elliptic lobes are membranaceous. The first and second series of stamens are pubescent and about 3.5 mm. long, the ovate obtuse anthers with introrse cells being slightly longer than the slender filaments. The two lower cells are about twice the size of the upper. This is true also of those of the anthers of the third series, which are extrorse, whereas the two upper cells are lateral. The filaments of the third series are once and a half again as long as the anthers and bear at the base two lateral stipitate glands which appear to be cordate and are equal in length to the supporting stipes. The fourth series or staminodia are \pm 1.25 mm. long, cordate, and borne on thick pubescent stipes half the entire length. The gynaeceum measures approximately 3.5 mm. in length and is pubescent throughout. The ovoid to subglobose ovary is shortly stipitate and bears a slender style which is twice its length. The stigma is obliquely peltate and conspicuous.

6. *Persea Schiedeana* Nees, Syst. Laurin. 130. 1836; Blake in Jour. Wash. Acad. Sci. 10: 16, fig. 1, B. 1920; Standley in Contr. U. S. Nat. Herb. 23: 289. 1922; Standley & Calderón, Lista Prelim. Pl. Salvador 85. 1925; Standley in Trop. Woods 21: 17. 1930; Standley in Field Mus. Publ. Bot. 10: 201. 1931; Standley & Record in op. cit. 12: 144. 1936; Standley in op. cit. 18: 458. 1937.

Persea sp. Schlechtendal & Chamisso in Linnaea 6: 365. 1831.

Persea gratissima var. δ *Schiedeana* Meissner in DC. Prodr. 15¹: 53. 1864.

Persea Pittieri Mez in Bot. Jahrb. 30: Beibl. 67: 15. 1901.

DISTRIBUTION: Forests of Mexico and Central America.

MEXICO: Vera Cruz: Forests of Misantla, *Schiede* (fl., TYPE of *P. gratissima* var. δ *Schiedeana* not seen); Barranca de Fortin near Cordoba, *Woronow* 3127 (fl., Ch). Mexico: Acapulco, *Hinton* 3167 (fl., GH). Michoacán: Llano, Coalcomán, *Hinton* 12987 (fl., GH). Oaxaca: Ubero, *L. Williams* 9151 (sterile, A). Chiapas: Between Copainaba and Coapilla, *Woronow & Juzepczuk* 1666 (fl., Ch). GUATEMALA: Huehuetenango: Northwest of Malacatancito, at km. 8 of the highway from Huehuetenango, in brushy quebrada in oak-forest, *Standley* 82186 (fl., Ch). Alta Verapaz: Near San Juan Chamelco, in pine-forest, *Standley* 92204 (fr., Ch); near Cobán, in wet thicket, *Standley* 69432 (fr., Ch). Izabal: Los Amates, *Kellerman* 7145 (fl., Ch). HONDURAS: Tegucigalpa: Mont. de la Flor, near the river, C. & V. W. von Hagen 1232 (sterile, NY). Yoro: El Porlillo Grande, C. & V. W. von Hagen 1005 (sterile, NY). BRITISH HONDURAS: Stann Creek: Middlesex, *Stevenson* V (Y8932) (fl., Y). NICARAGUA: N. E. without locality: *Englesing* 162 (fl., Y). COSTA RICA: Guanacaste: About houses in Nicoya, *Tonduz* 13794 (fl., A). Alajuela: Palmira, region of Zarcero, A. Smith H.327 (fl., Ch). Cartago: In valley of Rancho Redondo, Volcán Irazu, alt. 1500 m., *Pittier* (Herb. Inst. Costa Rica) 1156 (fl., type of *P. Pittieri* not seen); Rancho Redondo near San José, *Popenoe* 989 (fr., Ch); without locality, in 1905, *Wercklé* (fl., Ch). PANAMA: Chiriqui: Vicinity of Cerro Punta, P. H. Allen 1534 (sterile, Mo); Bajo Chorro, Boquete, *Davidson* 304 (fr., Ch), 427 (fl., A, Ch, Mo). Panama: Isla Taboga, P. H. Allen 1288 (fl., Mo).

NATIVE NAMES: "Aguacate" (Mexico, British Honduras, Costa Rica); "Aguacatón" (Panama); "Chalté," "Chaucte" (Guatemala); "Chinini" (Mexico); "Chuche" (Guatemala, San Salvador); "Chuti" (Honduras); "Coyó," "Coyocté," "Coyoté" (Guatemala); "Guaco" (Honduras); "Kiyau," "Kiyó," "Kotyó," "Shucte" (Guatemala); "Wild Pear" (British Honduras); "Yas" (Costa Rica).

This species, once considered a variety of *P. americana*, seems to warrant specific rank. The closest affinity is no doubt the common avocado, but the differences are significant. Popenoe (U. S. Dept. Agric. Bull. 743: 37. 1919) makes the comment that, although the fruits of the two entities resemble each other, the tree is distinct in foliage and floral characters. I agree also with Popenoe that the avocado group needs more intensive study in the field.

The branchlets of *P. Schiedeana*, as well as the lower surfaces of the young leaf-blades, are brown-tomentose. The leaf-blades are usually half as broad as long, up to 24 cm. long and 15 cm. broad; the petioles are up to 3 cm. long. The blades are irregularly elliptic and often obovate-elliptic, shining above and loosely reticulate, glaucescent and finely tomentose beneath. The base is frequently almost truncate and is usually rounded, the apex rounded, acute, or abruptly acuminate. The lateral nerves, of which there are 8-15 pairs, ascend at a variety of angles from the costa, 75-80° at the base and 45 or even 35° in the upper portion of the blades. The usually heavily pubescent subterminal numerous paniculate inflorescences bear persistent bracts and are shorter than the leaves, frequently appearing almost sessile, usually less than 10 cm. long, occasionally up to 15 cm. The flower, 6-8 mm. long, is borne on a slender pedicel almost equaling it in length. The narrowly ovate or lanceolate-ovate perianth-lobes are subequal and very pubescent without. The outer lobes measure 4-5.9 mm., the inner 4.5-6.4 mm. The stamens are \pm 3.8 mm. long and bear ovate obtuse anthers with the two upper cells smaller, sometimes about half the size of the two lower cells. The slender filaments are pubescent and twice as long as the anthers. The filaments of the inner series bear glands that are cordate-stipitate (the stipes equal to the glands), and are about one-third the entire length of the stamens. The fourth series consists of cordate staminodia borne on hairy stipes more than half the length of the staminodia. The pubescent gynaecium is \pm 3.8 mm. long, the slender style more than twice the length of the ovoid ovary. The fruits, of which I have not seen mature specimens, seem to be obovoid (slender and bottle-necked), and in the early stages very pubescent, later becoming glabrescent and roughened. The perianth-lobes increase somewhat in size and thickness and persist at the base of the fruits, subtended by the thickened and enlarged pedicels, also becoming glabrescent.

7. *Persea floccosa* Mez in Jahrb. Bot. Gart. Berlin 5: 148. 1889; Blake in Jour. Wash. Acad. Sci. 10: 15. 1920; Standley in Contr. U. S. Nat. Herb. 23: 290. 1922.

DISTRIBUTION: Mexico, in forests.

MEXICO: Puebla: Near Chinantla, *Liebmann 85* (fl., photo. of TYPE, Ch, NY, US). Chiapas: Ventana, near Siltepec, *Matuda 4545* (fr., A, NY); Rodeo, in virgin forest near Siltepec, *Matuda 4559* (fl., A, NY).

NATIVE NAME: "Aguacate cimarrón" (Mexico).

This species is characterized by the fulvous pubescence of the young branchlets, which soon become glabrescent and blackish red, with very prominent lenticels, and the dense ferruginous-lanose (according to the author) pubescence of the young leaves. Adult leaves are densely and manifestly foveolate-punctate and subglabrous above, while beneath they are glaucescent- and floccose-tomentose. They vary from 11-17 cm. long and 4.8-7.5 cm. broad, and are usually elliptic or occasionally narrowly

elliptic, the base obtuse or cuneate, the apex somewhat acuminate, with 7 or 8 pairs of lateral nerves diverging from the costa at an angle of 35° , the lower pairs of which are often irregularly arcuate and almost at right angles. The erect stout pyramidal inflorescence is up to 11 cm. long, the peduncle nearly half its length, and covered with a dense subferruginous pubescence. The flowers are densely pubescent, up to 5 mm. long, the pedicel 1–3 mm. The perianth-lobes are elliptic, rather acute, densely pubescent, the inner up to 3.4 mm. long, the outer slightly less. The stamens are about 2 mm. long, the slender pubescent filaments are approximately one-third longer than the ovate obtuse anthers, the two upper cells of which are smaller than the two lower ones. The stamens of the inner series bear conspicuous stipitate subglobose glands at the base. The pubescent staminodia are ± 1 mm. long, the stipes being one-half the entire length. The pubescent gynaecium is ± 2.4 mm. long, the ellipsoid ovary only slightly shorter than the slender style that bears an inconspicuous discoid stigma. The fruits, unknown to Mez, seem to be rather depressed-globose, measuring 3.5 cm. long and about 4 cm. broad, brownish in the dried state and verrucose, subtended by the remnants of the spreading lobes of the perianth, the whole supported by an enlarged glabrous pedicel 6 mm. long and 5 mm. in diameter at the apex.

Persea floccosa has an affinity with *P. americana* and *P. Schiedeana*, but the smaller depressed-globose fruits are very different. The leaves are on the whole smaller than those of the two latter species, as are the flowers. The inflorescences are longer, accordingly, being nearly the length of the leaves. A study of more complete material may very well show this to be a form of *P. americana*.

8. *Persea flavifolia* Lundell in Contr. Univ. Mich. Herb. 6: 17. 1941.

DISTRIBUTION: Known only from the type-locality and vicinity.

MEXICO: Chiapas: Mt. Ovando, April 9–12, 1937, *Matuda 1821* (fl., A, Ch, TYPE — Mich), *2651* (fl., A, Ch, NY).

This tree is remarkable for the stout branchlets, which are conspicuously angled, becoming striate-sulcate, early covered with a golden-sericeous tomentum, which becomes fuscous and eventually glabrescent. The older branchlets are conspicuously cicatricose. The petioles are golden-sericeous, striate, and up to 4.5 cm. long. The leaf-blades are coriaceous, elliptic-oblong or lanceolate-oblong, the base rounded or obtuse, the apex acute or obtusely subacuminate. They measure up to 21 cm. long and 8.5 cm. broad, early sparsely pubescent, soon glabrous, the surface yellow-green, the lower surface conspicuously golden-brown-sericeous. The costa is slightly impressed above and elevated beneath, everywhere golden-brown-sericeous. The lateral nerves, of which there are 7–12 pairs, are inconspicuous above but slightly elevated beneath. The reticulation is obscure throughout. The inflorescence is axillary and subterminal, consisting of numerous short compact many-flowered densely golden-brown-sericeous panicles not more than 4–6 (–7) cm. long. The flowers are 5–6 (–10) mm. long, including the short stout pubescent pedicel. The outer lobes are ovate or orbicular, ± 2.2 mm. long, thickly hairy within and densely sericeous without, those of the inner cycle being lanceolate-elliptic and up to ± 3.5 mm. long. The stamens of the two outer series are ± 2.2 mm. long, the ovate roundish anthers being shorter than the pubescent

filaments. Those of the inner series are ± 3 mm. long, the filaments bearing conspicuous reniform stipitate glands. The upper cells of the anthers are smaller than the lower, those of the outer series being introrse, the upper cells of the inner series being lateral and the lower extrorse. The staminodia are ± 1.25 mm. long, cordate, ovate, the pubescent stipes being more than one-half the entire length. The glabrous to pubescent gynaeceum is ± 3.2 mm. long, the subellipsoid glabrous or pubescent ovary shorter than the slender style topped by a large conspicuous capitate stigma. The fruit, of which I have seen no specimen, is globose, black, 1 cm. in diameter, the perianth-lobes being persistent.

Lundell relates this striking species to *P. Benthamiana* from Brazil. It appears also to have a close relationship to *P. podadenia*, also from Mexico, in spite of the occasional presence of pubescence on the ovary. The persistent sericeous pubescence of the leaf-blades and their shape separate it from the latter at once. *Mexia 1632*, a young fruiting specimen from Jalisco, may possibly belong here. The fruit seems very small and the infructescence still heavily pubescent. The leaves are on the whole small for this species, but the infructescence is shorter than that of *P. podadenia*, the only other possibility, and the lower part of the branchlet is heavily cicatricose — a characteristic of *P. flavifolia*.

9. *Persea Donnell-Smithii* Mez in Donnell Smith, Enum. Pl. Guatem. 2: 67. 1891, nom. nud.; in Arb. Kgl. Bot. Gart. Breslau 1: 113. 1892.

DISTRIBUTION: Mexico and Guatemala, in mountain-forests at 1220–2000 meters altitude.

MEXICO: Vera Cruz: Near Mirador, *Liebmann 11* (SYNTYPE, not seen). Chiapas: Coapilla, *Juzepczuk 1699* (fr., Ch); Pinada, Siltepec, *Matuda 1942* (fr., A, NY); in virgin forest, Letrero, near Siltepec, *Matuda 4355* (fl., young fr., A, NY); near Rancho Fenix, Hacienda Monserrate, *Purpus 10526, 13080, 14302* (fl., Ch). GUATEMALA: Alta Verapaz: Chicoyonito, alt. 1310 m., April, 1889, *J. D. Smith 1718* (fl., ISOSYNTYPE, Mo); between Cobán and San Cristóbal, *Cook & Doyle 89* (fl., Ch); Cobán, *Johnson 646* (fr., Ch); near Cobán, *Standley 69166, 69315* (fl., Ch); large swamp east of Tactic, *Standley 92394, 92520* (fl., Ch). Baja Verapaz: Region of Patal, *Standley 69565* (fl., Ch).

NATIVE NAMES: "Aguacate," "Sacsí" (Guatemala).

The nearest relative of this species seems to be *P. Chamissonis*, from Mexico. A short discussion of the points of difference is given under that species. Mez places *P. Donnell-Smithii* near *P. floccosa*, which to me seems, on account of its fruit characters, to be allied with the *P. americana* complex.

This species is striking because of the large (up to 18 cm. long and 12 [–15] cm. broad) coriaceous elliptic or obovate leaves, the lower surface of which is covered with a dense ferruginous tomentum, as are the stout petioles which measure up to 4 cm. in length and are frequently as thick as 5 mm. in diameter. The blades are often unequal at the base, cuneate or rounded, the apex usually rounded. The inflorescence, up to 10 cm. long though often only 4 cm. long, is narrowly subpyramidal-paniculate and is covered with a dense ferruginous tomentum, as is the infructescence. The flower has thick fleshy lobes that are hairy inside and densely tomentose without and are definitely spreading. The outer lobes are orbicular and up to 3 mm. long, the inner ovate-elliptic and nearly twice the length

of the outer. The two outer series of stamens are ± 3.8 mm. long, the pubescent filaments being longer than the broadly ovate anthers. The stamens of the inner series are ± 4.25 mm. long, the anthers narrowly oblong, the two upper cells lateral, the lower laterally extrorse. The filaments bear conspicuous reniform stipitate basal glands. The staminodia are ± 1.25 mm. long, obscurely sagittate, the stipes more than one-half the entire length, the whole densely pubescent. The seemingly glabrous gynaeceum, 4–5 mm. long, consists of a globose ovary surmounted by a slender style twice its length and bearing a conspicuous subtriangular stigma. The fruits are shining, globose, strongly apiculate, about 12 mm. diam., and borne on the persistent perianth-lobes which are somewhat enlarged, still heavily tomentose, and spreading to a diameter of 12 mm. The short tomentose pedicel is enlarged also to 3 mm. long and 2 mm. in diameter.

10. *Persea Chamissonis* Mez in Jahrb. Bot. Gart. Berlin 5: 168. 1889; Standley in Contr. U. S. Nat. Herb. 23: 292. 1922; Lundell in Contr. Univ. Mich. Herb. 7: 12. 1942.

DISTRIBUTION: In the forests of Mexico.

MEXICO: Vera Cruz: Chiconquiaco, *Schiede* (fr., fragm. of SYNTYPE, Ch). Puebla: Near Chinautla, *Liebmann* 1 (photo. of SYNTYPE, Ch, NY); Chinautla, in May 1841, alt. 2135 m., *Liebmann s.n.* (fl., fr., Ch, Mo).

The present species is distinguished by the ferruginous-tomentose branchlets that eventually become glabrate and blackish brown. The leaf-blades, with long petioles up to 3 cm. long (according to the collector), slightly canaliculate, and cinereous-tomentose, are alternate, usually obovate or elliptic, 9–13 cm. long, 3–7 cm. broad, chartaceous above and densely pubescent, becoming glabrescent, scattered- and spreading-pilose with longish hairs except for the costa, beneath somewhat glaucous and more crisped-pilose. The blade is densely and conspicuously reticulate on both surfaces and there are 6–8 pairs of lateral nerves diverging at an angle of 45° . The fruits are black, globose, apiculate, about 10–11 mm. in diameter, seated on the enlarged and rather horizontally spreading still densely ferruginous-tomentose lobes of the perianth, which form with the expanded tomentose tube about 1 mm. high a cupule about 12 cm. in diameter, and are subtended by the enlarged tomentose pedicel about 3 mm. long and 1.5 mm. broad.

Very close to *P. Chamissonis* is *P. Donnell-Smithii*, which differs in having its consistently larger leaf-blades (up to 17 cm. long and 12 cm. wide) heavily coriaceous and densely tomentose. They do not show prominent reticulations and are borne on a stout petiole up to 4 cm. long and 4–5 mm. thick, covered with a dense ferruginous and presently cinereous tomentum. The lateral veins of *P. Chamissonis* tend to ascend less arcuately than those of *P. Donnell-Smithii*. I have seen no inflorescence of *P. Chamissonis*, but presumably it is short. The inflorescence of *P. Donnell-Smithii* is longer than the infructescence of the former.

11. *Persea cinerascens* Blake in Jour. Wash. Acad. Sci. 10: 18, fig. 2. 1920; Standley in Contr. U. S. Nat. Herb. 23: 289. 1922.

DISTRIBUTION: Mexico, known only from the type.

MEXICO: Vera Cruz: Zacupán, June, 1916, *Purpus* 7671 (fl., TYPE not seen), 8144 (fr., not seen).

Blake has related this species to *P. Liebmanni* Mez, noting that it differs

in its larger flowers, longer anthers, staminodial glands glabrous on the inner face, and larger fruits.

This tree has branchlets densely sordid-rufescent and pilose-tomentose, becoming fuscous and sparingly pubescent. The chartaceous leaves crowded on the young branchlets have blades that measure $10-20 \times 5-8$ cm., are elliptic to oval-oblong or obovate, acute or short-pointed but blunt at the apex, with a cuneate base, above obscurely foveolate, sordidly pilose-tomentose chiefly on the costa and lateral nerves, beneath cinerascens, heavily so on the nerves, and prominently reticulate. The lateral nerves are 14-16 pairs and diverge from the costa at an angle of $45-65^\circ$. The petioles measure up to 3 cm. long. The axillary inflorescence is sordidly pilose-tomentose, 5-7 cm. long, paniculate, narrowly subpyramidal. The flowers are borne on stout pedicels up to 1 mm. long; the perianth is 7-8.5 mm. long, densely pilosulous-tomentose, with elliptic-oblong obtuse lobes, the outer somewhat shorter than the inner. The stamens of the two outer series are 4.5-4.8 mm. long, those of the inner series 5.2 mm. long, with biglandular filaments. The pubescent filaments are almost two-thirds the length of the stamens. The staminodia are 3 mm. long, the cordate apiculate apical gland, glabrous on the inner surface and pilose dorsally, presenting an unusual feature. The ovary is ± 1.5 mm. long, ellipsoid, glabrous, with a slender glabrous style more than twice its length. The fruits are subglobose, glaucous-blue, about 12 mm. diam., subtended by the persistent perianth-lobes which are slightly thickened to form a cupule 1 mm. high and 4.5 mm. in diameter.

12. *Persea Liebmanni* Mez in Jahrb. Bot. Gart. Berlin 5:166. 1889; Standley in Contr. U. S. Nat. Herb. 23: 292. 1922.

DISTRIBUTION: Known only from the type.

MEXICO: Oaxaca: Near Chinantla and Trapiche de la Concepción, *Liebmann* 115 (SYNTYPE not seen), 116 (fl., fr., photo. of SYNTYPE, Ch, NY).

According to the description, this species is set apart by having the angular branchlets appressed-yellowish-tomentellous and becoming glabrate and blackish brown in age. The sparse chartaceous leaf-blades, almost glabrous above and appressed-tomentellous-subsericeous beneath, are ovate or elliptic or elliptic-lanceolate, cuneate and often oblique at the base, and acuminate or subacute at the apex, measuring $14-26 \times 3.8-10.5$ cm., and borne on a petiole up to 4.5 cm. long, plane or slightly canaliculate. The 8-12 pairs of lateral nerves diverge from the costa at an angle of $35-45^\circ$. Above there is noticeable a prominent areolation, which beneath shows up as a loosely prominulous reticulation. The sericeous-tomentellous inflorescence is a many-flowered pyramidal panicle shorter than the leaves, about 15 cm. long, the peduncle up to 8 cm. long. The flowers, also subsericeous, are up to 5 mm. long, with the outer lobes one and one-half times shorter than the inner. The pilose filaments almost equal the subrectangular-oval anthers or are slightly longer. The staminodia are conspicuous, liguliform-sagittate, and densely pilose, the stipes being about one-half the entire length. The glabrous ovary is globose, twice as long as the style, which is topped with a discoid stigma. The fruit is globose, glaucescent-blackish, up to 7 mm. in diameter, seated on the spreading persistent and slightly enlarged perianth-lobes.

According to Blake, the only species known to which this has an affinity is *P. cinerascens*, of which unfortunately no material is available.

13. *Persea vesticula* Standley & Steyermark in Field Mus. Publ. Bot. 23: 116. 1944.

DISTRIBUTION: Volcanic mountain-slopes of Guatemala.

GUATEMALA: Huehuetenango: Cerro Huitz, between Mimanhuitz and Yulhuitz, Sierra de los Cuchumatanes, *Steyermark* 48571 (fr., Ch). San Marcos: Top of escarpment, between La Vega ridge along Río Vega and northeast slopes of Volcán de Tacaná, near the Mexican boundary, alt. 2500–3000 m., Feb. 20, 1940, *Steyermark* 36207 (fl., TYPE, Ch). El Progreso: In cloud-forest, Sierra de las Minas, hills north of Finca Piamonte, *Steyermark* 43558 (sterile, Ch).

NATIVE NAME: "Canok" (Huehuetenango).

The species so recently described by Standley and Steyermark has not turned up in any other collection. It is distinctive at once for its sturdy pubescent densely foliose branchlets, bearing rigidly coriaceous leaf-blades glabrous to glabrescent above and minutely pubescent beneath, borne on stout petioles 1–2 cm. long, the margin slightly recurved, particularly at the base, oblong-elliptic, 10–17 \times 3.5–6.5 cm. The lateral nerves are 9 or 10 (–12) pairs and faintly visible above and definitely elevated beneath, diverging at an angle of approximately 45°. The subterminal profusion of robust inflorescences, almost forming a single corymbose structure at the tips of the branchlets, is many-flowered and ferruginous-tomentose. The flowers are 12–14 mm. in diameter, the outer perianth-lobes subtriangular, thickly pubescent, \pm 3.4 mm. long, the inner \pm 7.25 mm. long, elliptic. The stamens are \pm 4.7 mm. long, the ovate obtusely apiculate anthers almost as long as the filaments. The anthers of the third series are more oblong-rounded, with pubescent filaments and two stipitate glands about one-fourth the length of the entire stamens. The staminodia are irregularly petaloid, sagittate, stipitate, dorsally pubescent, measuring \pm 2.2 mm. in length, the stipes about equal to one-half the length of the staminodia. The gynaeceum is \pm 5 mm. long. The slender style is twice as long as the glabrous ellipsoid to subglobose ovary and is topped by a capitate conspicuous stigma. The subglobose fruit measures 3.5 cm. in diameter and is borne in a thick subverrucose cupule 12 cm. in diameter, 5 mm. long, and \pm 2 mm. deep. The supporting pedicel is about 5 mm. long and 8 mm. in diameter at the apex.

Standley and Steyermark relates this species to *P. longipes*, but in my opinion it is more closely allied to the *P. americana* complex, the inflorescence and large fruit indicating this. The thickened and ligneous fruit-cupule, however, is certainly not typical of the *Persea* species of this region.

14. *Persea pallida* Mez & Pittier ex Mez in Bull. Herb. Boiss. II. 3: 231. 1903; Standley in Field Mus. Publ. Bot. 18: 458. 1937.

DISTRIBUTION: Costa Rica, known only from the type.

COSTA RICA: Puntarenas: Valle de Coto, alt. 1400 m., *Pittier* (Herb. Inst. Costa Rica 11111) (fl., TYPE not seen) (flowers in February).

Only a flowering specimen of this species was described. The stout branchlets, early pruinose with short yellowish pubescence, later become glabrous. The chartaceous sparse penninerved leaf-blades, 15 \times 6 cm., are densely prominulous-reticulate, pale to almost glaucous beneath, and are subtended by slightly canaliculate petioles up to 2 cm. long. The corymbose inflorescence is entirely covered with a remarkable white indument. The flowers are about 4 mm. long and borne on very short and thick pedicels 2–3 mm. long. The lobes are elliptic, thick and fleshy,

broadly acute; the filaments of the stamens are shorter than the broad well rounded and emarginate or obtuse anthers. The anthers of the stamens of the third series are laterally dehiscent and are large, fleshy, and sessile. The slender style is three times as long as the subglobose glabrous ovary and bears a large often triangular stigma.

The nearest affinity of this species is the following new species, also from Costa Rica and found in adjacent Panama as well. Mez remarks that superficially one is reminded of the habit of *Phoebe glaucescens* from India, but that a careful study reveals relationship to the Andean species *Persea ferruginea* and *P. vestita*, neither of which latter are available at present.

15. *Persea rigens*, sp. nov.

Arbor ad 30 m. alta ramulis robustis, brunneis vel maculato-brunnescentibus, sulcatis, glabris. Folia alternata vel subverticillata, petiolis brunneis vel fuscis, crassis haud canaliculatis, glabris, ad 1.5 cm. longis et 3 mm. latis, laminis utrinque glabris, juventute membranaceis, mox rigide coriaceis, in sicco olivaceo-viridescentibus, ellipticis, 20–25 (–33) cm. longis et ad 12 cm. latis, basi cuneatis, apice obtusis vel haud obtuse subacuminatis, penninerviis, nervis 7- vel 8(–9)-paribus supra leviter subtus conspicuiore elevatis, angulo 45–55° divergentibus, costa supra subplana subtus conspicue elevata, utrinque satis minute reticulatis. Inflorescentia paniculis numerosis composita, paniculis ad 5 ex axilla quave folii decidui summi, dense griseo- vel fulvo-albescentibus, ad 10 cm. longis et 2 cm. latis, pedunculis ad 6 cm. longis. Flores ad 4 mm. longi, campanulati, dense tomentosi, pedicellis ad 4 mm. longis pubescentibus, lobis subaequalibus crassis tomentosis ad 3 mm. longis; staminibus ser. I & II plus minusve variabilibus saepe subpetaloideis, ± 1.25 –2.2 mm. longis filamentis pubescentibus, ser. III ± 2.2 mm. longis biglandulosis, glandulis stipitatis; staminodiis stipitatis subcordatis, ± 1.7 mm. longis; gynaecio ovario ovoideo glabro ± 2.8 mm. longo, quam stylo $\frac{2}{3}$ longiore. Infructescencia robusta glabrescens vel glabra, ad 15 cm. longa, rubescens. Fructus ignotus. Pedicellus incrassatus, rugosus, ad 7 mm. longus et 5 mm. latus, apice loborum reliquis, ad 7 cm. diam. insignitus.

DISTRIBUTION: Costa Rica and adjacent Panama.

COSTA RICA: Without locality, in 1943, *Little 6075* (fl., TYPE, Ch). PANAMA: Bocas del Toro: Daytonia Farm, region of Almirante, Feb. 2, 1928, *G. P. Cooper 458* (Y12076) (fr., Ch, Y) (tree 18 m. high, 35 cm. diam., said to reach 30 m. and 95 cm. diam., with stout horizontal branches at top; used for boards and rough lumber).

NATIVE NAME: "Timber Sweetwood" (Panama).

The dense many-panicled inflorescences of this species present a striking appearance, clothed with a heavy grayish or fulvous-white tomentum. As many as four panicles up to 10 cm. in length arise from a single axil of leaves that are early deciduous. Unfortunately, Cooper's number has no fruit attached, but the enlarged peduncles and pedicels of the infructescence bearing the remains of the perianth-lobes leave no doubt that the specimen is conspecific with the Costa Rican tree.

The species is near *P. pallida*, but differs in not having corymbose inflorescences and in its large leaf-blades, 33 \times 12 cm., only slightly paler beneath and not glaucescent, with petioles not more than 1.5 cm. long. The perianth-lobes are not elliptic but broadly ovate, and the pedicel is equal

to if not longer than the flowers. The ovary is ovoid instead of subglobose and is two-thirds the length of the entire gynaecium, instead of one-fourth as in *P. pallida*. The type of stamen is not typical for *Persea*, but the species seems to belong in the genus.

16. *Persea Skutchii*, sp. nov.

Arbor ad 21 m. alta, ramulis rubescentibus striatis, juventute pallide et adpresse ferrugineo-tomentosis, mox glabris. Folia alternata vel subverticillata petiolis gracilibus leviter canaliculatis brunneis ad 3.5 cm. longis, laminis supra glabris subtus sparse pubescentibus, pergamentaceis, in sicco supra pallide viridescentibus subtus pallide brunnescentibus, ellipticis vel late ellipticis, 10–17 cm. longis et 3 (–7.5) cm. latis, basi rotundatis vel cuneatis, interdum obliquis, apice obtusis vel acutis vel acuminatis, saepe emarginatis, margine plus minusve undulatis, penninerviis, costa supra impressa subtus elevata pubescente, nervis ad 12-paribus brunnescentibus utrinque plus minusve planis, angulo 67–56° divergentibus, utrinque rete venularum minuto et obscure prominulo. Inflorescentia axillaris paulo laxe paniculata, minute sericeo-fulvo-pubescentibus, ad 12 cm. longa. Flores ad 6 mm. longi, campanulati, dilute flavescentes, pedicellis ad 5 mm. longis gracilibus pubescentibus, lobis exterioribus late ovatis membranaceis pubescentibus ± 1.5 mm., interioribus lanceolatis pubescentibus ± 5 mm. longis; staminibus ser. I & II ± 3.4 mm. longis antheris oblongis quam filamentis pubescentibus plusquam triplo longioribus, ser. III ad ± 3.5 mm. longis biglandulosis glandulis stipitatis; staminodiis crassis utrinque pubescentibus subcordatis, stipitatis, ± 2.7 mm. longis; gynaecio glabro ± 3.4 mm. longo, ovario ovoideo basi leviter constricto, longitudine quam stylo brevior, stigmate conspicue triangulari-peltato. Fructus nigrescens lucidus, globosus, inconspicue apiculatus, ad 7 mm. diametro, glaber, pedicello aliquid incrassato apice ad 2 mm. diametro sparse pubescente apice plus minusve 6 mm. diametro, loborum reliquis ornato.

DISTRIBUTION: Costa Rica and Panama, 300 to 1675 meters altitude.

COSTA RICA: Puntarenas: Buenos Aires, *Tonduz 6680* (fl., Ch). Alajuela: Edge of wooded ravine in Pacific tropical zone, Atenas, *A. Smith P.2479* (fl., A). San José: In clearings, vicinity of El General, *Skutch 3117* (fl., A, NY); basin of El General in clearing, alt. 675–900 m., March 1940, *Skutch 4812* (fl., TYPE, A) (tree 15 m.; flowers yellowish); Cerro de Prati, Escazú, *Solis 183* (fl., Ch); Santa María de Dota, *Stork 2416* (fr., Ch). PANAMA: Coclé: Vicinity of El Valle, south rim (dry), *P. H. Allen 1781* (fr., Mo, NY); hills south of El Valle de Anton, *P. H. Allen 2498* (fr., A).

NATIVE NAME: "Aguacatillo" (Costa Rica).

This species is akin to *P. caerulea*, from South America, but may be separated from it by the inflorescences being shorter than the leaves and by the less erect lateral nerves. The leaves are usually acute or subacuminate rather than rounded-obtuse, as those of *P. caerulea*. The blackish (in the dried state) fruits are depressed-globose, lack entirely the bloom of those of the latter species, and do not measure more than 8 mm. in diameter at the most.

17. *Persea Hintonii*, sp. nov.

Arbor magna [?], ad 5 m. alta, ramulis flavo- vel fulvo-tomentosis mox sparse griseo-tomentosis demum glabrescentibus fusco-brunneis, subsulcatis. Folia alternata, petiolis flavo-tomentosis ad 3.5 cm. longis canalicu-

latis, laminis supra glabris costa pubescente excepta subtus utrinque sparse cano- vel flavo-tomentosis, coriaceis, supra in sicco pallide viridescens, subtus glaucis, oblongo-ellipticis, 15–20 cm. longis et 5–6.5 (–8) cm. latis, basi rotundatis vel cuneatis et obliquis, apice rotundatis, obtusis vel acutis et minute apiculatis, penninerviis, costa plus minusve conspicua leviter impressa subtus satis elevata utrinque flavescente et pubescente, nervis 10–12(–15)-paribus supra obscurissime leviterque elevatis, subtus satis elevatis et conspicuis flavescentibus angulo 35–45° divergentibus, rete venularum supra obscuro subtus satis conspicuo. Inflorescentia axillaris, compacte paniculata vel subcapitata, 3–5.5 (–10) cm. longa, dense fulvo-vel flavo-tomentosa, pedunculo ad 5.5 cm. longo. Flores ad 7.5 mm. longi, confertissimi, perianthio campanulato, lobis exterioribus crassis ovatis extus pubescentibus \pm 2.7 mm. longis, interioribus lanceolatis extus utrinque intus apice pubescentibus \pm 4.7 mm. longis; staminibus ser. I & II \pm 2.15 mm. longis, antheris ovatis saepe obtuse breviterque acuminatis variabilibus saepe quam filamentis pubescentibus plusquam duplo longioribus, ser. III \pm 3.4 mm. longis biglandulosis, glandulis stipitatis; ubique loculis superioribus parvissimis, ser. I & II introrsis, ser. III laterali-extrorsis; staminodiis anguste ovatis graciliter stipitatis \pm 1.7 mm. longis pubescentibus; gynaeceo glabro \pm 3.8 mm. longo, ovario subgloboso leviter stipitato, quam stylo $1\frac{1}{2}$ brevior, stigmate conspicuo peltato. Fructus immaturus(?) atro-violaceus ellipticus, apiculatus, 5–8 mm. diam., glaber, cupula loborum tomentosorum incrassatorum subtentus, pedicello incrassato breviter flavo-pubescente ad 2 mm. longo et lato.

DISTRIBUTION: Known only from Mexico.

MEXICO: Jalisco: Stream-side, San Sebastian, trail from Hacienda del Ototal to Hacienda La Indrilla, *Mexia* 1699 (fl., GH). Puebla: Near Honey Station (Trinidad), *Pringle* 8938 (fl., GH). Mexico: Temascaltepec: Temascaltepec, on hill, alt. 1700 m., March 27, 1933, *Hinton* 3533 (fl., TYPE, GH) (large tree), *Hinton* 4024 (fr., GH); Llano, Tejupilco, *Hinton* 3980 (fr., GH). Guerrero: San Antonio-Buenos Aires, Montes de Oca, hill, *Hinton* 14027 (fl., GH); by stream in oak-forest, Chilacayote-Soledad, Mina, *Hinton* 14195 (fl., GH).

NATIVE NAME: "Laurel cimarrón" (Temascaltepec).

The new species is conspicuous for the fulvous or golden-brown pubescence found on the young branchlets, the lower surface of the usually very pale green leaves, and the inflorescence itself.

This species seems to stand alone. There are features that apparently relate it to *P. longipes* and *P. podadenia*, i.e., the inflorescence-characters, but a glance at the infructescence destroys this connection. The shape of the leaves, the difference in stigma and style, and the enlarged perianthlobes persistently surrounding the fruit without being reflexed also separate this species from *Persea podadenia*.

18. *Persea veraguasensis* Seemann, Bot. Voy. Herald 193. 1854; Meissner in DC. Prodr. 15¹: 51. 1864, as *P. veraguensis*; Standley in Contr. U. S. Nat. Herb. 23: 291. 1922.

Persea caerulea sensu Standley & Calderón, Lista Prelim. Pl. Salvador 85. 1925; Standley in Contr. U. S. Nat. Herb. 27: 183. 1928, in Field Mus. Publ. Bot. 18: 458. 1937; non Mez.

Persea laevigata var. β *caerulea* Meissner in DC. Prodr. 15¹: 49. 1864, excl. spec. S. Amer.; sensu Hemsley, Biol. Centr. Am. Bot. 3: 72. 1882.

DISTRIBUTION: In woods of Costa Rica and south into Chiriquí, Panama, at altitudes of 600–2300 meters.

COSTA RICA: Without locality, *Oersted* 7 (cited by Meissner under *P. laevigata* β *caerulea*, not seen); Patarrá, *Orozco* 341 (fl., Ch). Alajuela: Open woodland of subtropical zone in semi-shade, Palmira, Alfaro Ruiz, *A. Smith* H.964 (fl., A, Ch, NY). PANAMA: Chiriquí: Bajo Mono, Boquete, *Davidson* 516 (fr., A, Ch, Mo); savannas of Boquete, *Davidson* 753 (fl., A, Ch, Mo); Volcán de Chiriquí, *Seemann* 863 (fr., TYPE of *P. veraguasensis* not seen); Río Chiriquí Viejo Valley near El Volcán, *P. White* 213 (fr., Mo); in the open llanos, about a mile from Bambite, valley of the upper Río Chiriquí Viejo, *P. White* 334 (fr., Mo).

NATIVE NAMES: "Aguacatillo," "Aguacate de Mico" (Standley).

This tree varies from 3 to 25 m. high, with the base 50 cm. diam., according to the collectors. The branchlets are heavily striate, angled, early densely subferruginous-sericeous, presently glabrescent and atro-rubescens or mottled green-brown. The chartaceous leaf-blades are oblong-elliptic or elliptic, often with a rhomboid base, acute, acuminate, or obtuse, dark green with lustre above, glabrescent and pale beneath or glaucescent with sericeous pubescence which may not persist. The costa above is slightly elevated and canaliculate, and the 8–10 pairs of slender lateral nerves are obscure above and conspicuous beneath. The petiole is slender to robust and rusty-pubescent to glabrescent, only faintly canaliculate, and measures to 2.5–3 cm. in length. The inflorescence consists of axillary few-flowered ferruginous-sericeous-tomentose panicles shorter than the leaves, borne on fairly stout sericeous peduncles up to 6 cm. long. The densely pubescent flowers are up to 4 mm. long, sessile or borne on pubescent pedicels less than 1 mm. long; the fleshy lobes, buff to tawny-olive according to the collectors, are unequal, the elliptic outer lobes measuring ± 1.25 mm. and the lanceolate-elliptic inner ones ± 2.15 mm. The stamens measure up to ± 2.15 mm., the hairy filaments slightly longer than the ovate or oblong anthers of the first two series. The anthers of the third series are oblong and the filaments are biglandular. The fourth series or staminodia are thin, flat, ligulate, and hairy, ± 1.7 mm. long. The gynaecium is ± 3.4 mm. long, the glabrous ovoid ovary only slightly stipitate, being nearly as long as the sparsely pubescent style, which is topped by a smallish spreading discoid stigma. The fruits are globose, apiculate, with a bluish bloom, and measure 10–11 mm. in diameter. They are subtended by a cupule formed by the persistent spreading and slightly enlarged pubescent perianth-lobes (pale green), which are supported by the slightly enlarged pubescent dark red pedicel now measuring up to 3 mm.

This species has been masquerading under the name of *P. caerulea*, which species was illustrated by Ruiz & Pavon as *Laurus caerulea* (*Laurographia* t. 2, 1802) from Peru, which is said to occur in Colombia, Venezuela, and Bolivia as well. This latter species, however, has inflorescences many-flowered, branched and spreading, and longer than the leaves. The leaf-blades are 8–23 cm. in length, with the petioles and nerves red. The fruits are less than 1 cm. in length and are seated on the persistent perianth-lobes, which are scarcely enlarged, but finally spreading or reflexed, supported by the hardly enlarged pedicel.

The nearest affinity in our locality is *P. podadenia*, found only in Mexico.

19. *Persea podadenia* Blake in Contr. Gray Herb. n.s. 52: 62. 1917; Standley in Contr. U. S. Nat. Herb. 23: 291. 1922.

Persea podadenia var. *glabriramea* Johnston in Contr. Gray Herb. n.s. 70: 69. 1924.

DISTRIBUTION: In the woods of northern Mexico, predominantly up to 1050 m. altitude, and also in the mountains of Oaxaca and Vera Cruz; possibly in British Honduras.

MEXICO: Sonora: Oak canyon near water, in the upper Sonoran region, Tepopa, Río Mayo, *Gentry* 2235 (fl., A); oak-forest in moist canyon, Curohui, Río Mayo, *Gentry* 3661 (fl., A, Ch); vicinity of Alamos, *Rose, Standley & Russell* 13084 (fl., GH). Chihuahua: Side of a canyon in the oak-country of the upper Sonoran region, Batopilillas, Río Mayo, *Gentry* 2620 (fr., A). Tamaulipas: La Vegonia, vicinity of San José, *Bartlett* 10034 (fr., GH). Nuevo Leon: Scattered along arroyo in pine-oak wood, Potrero Redondo west to Puerto a Laguna Sanchez and beyond, Municipio de Villa Santiago, *C. H. Mueller* 2119 (fr., A); along arroyo bottoms on trails between Potrero Redondo and Laguna Sanchez, Municipio de Villa Santiago, *C. H. Muller* 2736 (sterile, GH), *C. H. Muller* 2751 (fr., GH). Durango: San Ramón, April 21–May 18, 1906, *E. Palmer* 119 (fl., ISOTYPE of *P. podadenia*, Ch, Mo). Vera Cruz: Orizaba, *Botteri* 81 (type of *P. podadenia* var. *glabriramea* not seen). Oaxaca: Zempoaltepec, *Liebmann* 768 (*Lauraceae* 79) (fl., Ch.). ?BRITISH HONDURAS: Stann Creek: All Pines, *Schipp* 566 (fr., Ch, GH, NY).

NATIVE NAMES: "Laurel" (Jalisco); "Laurel," "Laurel de la sierra" (Sonora); "Salsafra" (Nuevo Leon).

Persea podadenia, a small tree or shrub, may be recognized at once by its lanceolate acutish to acuminate greenish leaves 6–15 cm. long and 2–4 cm. broad, that are glabrous and very smooth in texture, except for the slightly impressed costa on the upper surface, and beneath glaucescent with the heavy costa elevated and the delicate lateral nerves slightly so. The nerves number up to 14 pairs and usually diverge from the costa at an angle of about 45–55°. The slender pubescent to glabrous petioles are striate and canaliculate, measuring up to 2 cm. long and 1–1.5 mm. wide. The short inflorescences barely reach to one-third the length of the leaves. They are paniculate or subcapitate and completely covered with a dense golden-brown-sericeous pubescence. The flowers are about 5 mm. long including the short pedicels. The broadly ovate acute outer perianth-lobes are hairy throughout, \pm 2.15 mm. long, the inner elliptic-ovate, \pm 3 mm. long. The stamens of the two outer series are \pm 1.7 mm. long, the ovate roundish anthers about equalling the thick pubescent style and with the cells all introrse. Those of the inner series have anthers that are oblong, the upper cells lateral, the lower laterally extrorse, and the filaments bear two subsessile reniform glands near the base. The staminodia are \pm .8 mm. long, subovate, very pubescent. The stipes equal one-half the entire length. The glabrous gynaeceum is \pm 2.6 mm. long, the ovary ellipsoid, almost equalling the rather thick style, which is topped by a conspicuous subcapitate stigma. I have not seen the fruit of the type, but additional material shows an ellipsoid to subglobose apiculate purple-glaucous fruit subtended by perianth-lobes which have become somewhat enlarged and lignified. The lobes persist and are slightly reflexed, or their tips slough off leaving only the tube showing the line of decurrence of the lobes.

The variety described by Johnston seems from the description to be merely a variation of the species not worthy of varietal rank. I have not seen the type, which is from Orizaba, nor have I seen any material from that region which would seem to answer the description. Possibly the British Honduras specimens may match the type.

20. *Persea Standleyi*, sp. nov.

Arbor 7.5–12 m. alta, ramulis atro-rubrescentibus striatis glabrescentibus

dense foliosis. Folia alternata vel subverticillata, petiolis leviter pubescentibus striatis rubescentibus satis gracilibus, ad 3.5 cm. longis et 2 mm. latis, laminis utrinque glabris coriaceis in sicco viridescenti-brunneis, lanceolatis vel oblanceolatis, ad 20 cm. longis et 4.5 cm. latis, basi obtusis saepe obliquis, apice obtusis vel attenuato-acutis vel acutis vel subacuminatis, penninerviis, costa supra leviter impressa subtus valde elevata, nervis 10–12-paribus supra obscuris subtus leviter elevatis angulo 35–45° divergentibus, rete venularum supra obscuro subtus plus minusve prominulo subareolato. Inflorescentia axillaris subcapitata, foliis brevior, ad 5 cm. longa, brunneofulvo-sericea, pauciflora, pedunculo ad 3 cm. longo pubescente. Flores immaturi, brevipedicellati, perianthio fulvo-sericeo-tomentoso, lobis distincte 5-nerviatis ovatis extus dense pubescentibus exterioribus \pm 2.15 mm. longis interioribus \pm 3 mm. longis; staminibus ser. I & II \pm 2.15 mm. longis, antheris ovato-oblongis apiculatis, quam filamentis pubescentibus duplo longioribus, ser. III \pm 2.6 mm. longis, antheris anguste ovatis obtusis filamentis pubescentibus aequalibus conspicue biglandulosis; staminodiis ovatis pubescentibus \pm 0.8 mm.; gynaecio glabro ad 3 mm. longo, ovario subgloboso longitudine $\frac{1}{3}$ gynaecii aequante brevistipitato, stigmatate conspicuissime triangulari angulis decurrentibus. Fructus immaturus(?) viridis, globosus, apiculatus, 9 mm. diam., perianthii lobis pubescentibus nonnihil rigidis incrassatis (?) plus minusve persistentibus subtentus, pedicello incrassato pubescente.

DISTRIBUTION: In forests on volcanic slopes of Guatemala at an altitude of 1500–2100 m., and possibly in the region of volcanoes of Vera Cruz, Mexico.

MEXICO: Vera Cruz: Nogales, *Matuda 1118* (fl., A). GUATEMALA: Chiquimula: Volcán Quezaltepeque, 3–4 miles northeast of Quezaltepeque, *Steyermark 31491* (fr., Ch). Sololá: Trail between slopes of Volcán Santa Clara and town of San Pedro, alt. 1900–2100 m., June 6, 1942, *Steyermark 47130* (fl., TYPE, Ch) (tree 12 m.; leaves firmly membranous, deep green above, paler green beneath).

Persea Standleyi approaches *P. podadenia*, but may be separated from it by the generally larger non-glaucous longer-petioled leaf-blades, which are subareolate-reticulate beneath, and by the lesser number of lateral nerves diverging at a smaller angle from the costa. It is possible that more complete material may prove *P. Standleyi* to be an extreme variation of *P. podadenia*.

The species is named for Dr. Paul C. Standley, who, through his collections and floristic work, has contributed greatly to our knowledge of Mexican and Central American trees and shrubs.

21. *Persea sessilis* Standley & Steyermark in Field Mus. Publ. Bot. 23: 115. 1944.

DISTRIBUTION: Guatemala, in the mountains, at 2100–2400 m. altitude.

GUATEMALA: Zacapa: Upper slopes, Sierra de las Minas along Río Repollal to summit of mountain, alt. 2100–2400 m., Jan. 12, 13, 1942, *Steyermark 42487* (fr., TYPE, Ch) (shrub 1.5 m., leaves firmly chartaceous-subcoriaceous, dull green above, with yellow midrib, blue-silvery beneath; peduncle dull rose; fruit green, shining).

This shrub, with its stout terete densely foliose branchlets, may be easily distinguished by its lanceolate-oblong coriaceous leaves, acute to acuminate at the apex and attenuate but distinctly cordate at the base, borne on thick stout petioles so short as to make the leaves appear sessile. In the dried state, the leaf-blades are greenish brown above, castaneous-brownish beneath, the stout costa bright-castaneous, slightly impressed above and exceedingly prominent beneath. The lateral nerves, which number up to 20

pairs, are impressed and rather obscure above but delicately elevated and prominent beneath, and for the most part ascend at an angle of 55–65°, with the exception of the basal pairs which are almost at right angles to the costa. The loose reticulation is obscure on the upper and prominent on the lower surface, whereas the minute areolation apparent on the upper surface is less so on the lower. The infructescence shows the remnants of a sericeous pubescence, is shorter than the leaves (about 10–12 cm. long), and seems to be cymose-paniculate with ascending branchlets. The fruits are immature, according to Standley, green, shining, globose, about 1 cm. in diameter, and borne on the expanded and patent perianth-lobes that still persist and are pubescent. The expanded pedicel is dull rose, according to the collector.

There seems to be a relation between this species and *Persea Standleyi*, also from Guatemala. The most striking difference is the occurrence of sessile leaves in the former.

DOUBTFUL SPECIES OF PERSEA

Persea psychotrioides Sprengel, Syst. Veg. 2: 269. 1825.

The type of this Mexican species has not been seen, but Mez says that it belongs with *Phoebe psychotrioides*.

SPECIES EXCLUDED FROM PERSEA

Persea amplexicaulis Schlechtendal & Chamisso = *PHOEBE AMPLEXICAULIS* (Schlechtendal & Chamisso) Mez.

Persea amplifolia Mez in Standley & Calderón = *PHOEBE AMPLIFOLIA* Mez & J. D. Smith.

Persea Austin-Smithii Standley = *BEILSCHMIEDIA* sp.

Persea effusa Benthams & Hooker = *OCOTEA EFFUSA* (Meissner) Hemsley.

Persea effusa Hemsley = *PHOEBE EFFUSA* Meissner.

Persea Gentlei Lundell = *NECTANDRA* sp.

Persea Hartwegii (Meissner) Hemsley = *PHOEBE PACHYPODA* (Nees) Mez.

Persea Matudai Lundell = *NECTANDRA SINUATA* Mez.

Persea mexicana Hemsley = *PHOEBE MEXICANA* Meissner.

Persea ? *Orizabae* Martens & Galeotti = *LITSEA GLAUDESCENS* var. *SUBSOLITARIA* (Meissner) Hemsley.

Persea salicifolia (Nees) Hemsley = *PHOEBE SALICIFOLIA* Nees.

2. *Phoebe* Nees

Phoebe Nees, Syst. Laurin. 98. 1836; Meissner in DC. Prodr. 15¹: 29. 1864; Mez in Jahrb. Bot. Gart. Berlin 5: 180. 1889.

DISTRIBUTION: In this hemisphere in tropical and subtropical regions; found in Mexico, Central America, the West Indies, and South America. Many species occur in eastern Asia, the number of species increasing in India, and also in Malaysia and the Philippines, with a few species in New Guinea.

The trees or shrubs of *Phoebe* in Mexico and Central America have alternate or subverticillate leaves that are penninerved or triplinerved. They vary in shape, size (not more than 30 cm., usually below 12 cm. long), and texture of the leaf-blades, as well as in pubescence. The inflorescences are paniculate with no involucre. The flowers are perfect, the tube short or lacking entirely. The usually equal perianth-lobes are thin or occasionally fleshy, persistent or deciduous. The stamens of the two outer series bear

anthers that are usually regularly obtusely ovate, the large introrse cells occupying the anther almost completely, the two lower cells touching the upper at their bases. The stamens of the inner or third series bear anthers that are extrorse or the two lower cells are extrorse and the two upper cells are laterally extrorse. The staminodia are conspicuous, stipitate-cordate, the stipes often pubescent. The glabrous (in this area) gynaeceum consists of a subglobose or ellipsoid ovary, with a conspicuous style that is equal to or shorter than the ovary. The stigma is variable, capitate, discoid or obtuse. The fruit is ellipsoid or subglobose, and borne in a shallow cupule that frequently bears the remnants of the perianth-lobes on the margin. The cupule is seated on an enlarged pedicel which is usually expanded considerably at the apex.

KEY TO THE SPECIES OF PHOEBE

- A. Leaf-blades triplinerved or subtriplinerved.
 - B. Leaf-blades subtriplinerved or triplinerved, not more than 11 cm. long.
 - C. Leaf-blades elliptic, usually definitely caudate-acuminate.
 - D. Young branchlets, leaves, and inflorescence densely ochraceous-tomentellous; largest leaf-blades very broadly elliptic.....1. *P. Tonduzii*.
 - D. Young branchlets, leaves, and inflorescence not ochraceous-tomentellous; largest leaf-blades elliptic.
 - E. Inflorescence longer than leaves.
 - F. Subtriplinervation obscure; all axils glandular-pubescent; leaf-blades subcoriaceous, not more than 13 cm. long; branchlets glabrous at maturity.....2. *P. effusa*.
 - F. Triplinervation conspicuous; only lowermost axils glandular-pubescent; leaf-blades usually definitely coriaceous, 15-17 cm. long; branchlets fulvo-tomentellous, becoming glabrescent.....3. *P. costaricana*.
 - E. Inflorescence shorter than leaves.
 - F. Petioles to 9 mm. long; leaf-blades subcoriaceous to chartaceous; fruits seated fully exposed on enlarged perianth-tube.....4. *P. Barbeyana*.
 - F. Petioles to 2.5 cm. long; leaf-blades coriaceous; base of fruits immersed in shallow cupule.....5. *P. Brenesii*.
 - C. Leaf-blades lanceolate, oblong-lanceolate or ovate-lanceolate, acutish or acuminate, not caudate-acuminate.
 - D. Apex of the leaf-blades long-falcate-acuminate; largest blades up to 22 cm. long.....6. *P. longipes*.
 - D. Apex of the leaf-blades not falcate-acuminate; largest blades not more than 13 cm. long.
 - E. Panicles never more than 6 cm. long; largest leaf-blades not longer than 9 cm. long and 2-3 cm. broad.
 - F. Leaf-blades glabrous, concolorous; reticulation elevated above.....7. *P. subtriplinervia*.
 - F. Leaf-blades rufescent beneath and glaucous; reticulation minute, the veins deeply impressed above.....8. *P. saicifolia*.
 - E. Panicles 6.5-12 cm. long, long-pedunculate; largest leaf-blades not less than 11 cm. long, usually not less than 15 cm. long.
 - F. Leaf-blades areolate, glabrous.....9. *P. areolata*.
 - F. Leaf-blades not areolate, softly pubescent beneath.10. *P. Arsenei*.
 - B. Leaf-blades usually definitely triplinerved; largest leaf-blades not less than 11 cm. long, usually not less than 15 cm. long.
 - C. Inflorescence shorter than the leaves.

- D. Inflorescence composed of numerous subterminal and axillary spike-like racemose panicles up to 15 cm. long with numerous whitish gray-pubescent flowers.....11. *P. mexicana*.
- D. Inflorescence composed of axillary rather few-flowered short loose panicles usually less than 10 cm. long, more or less glabrous.
 - E. Leaf-blades narrowly elliptic or lanceolate, subacuminate or acute, inconspicuously reticulate, chartaceous, the base cuneate; largest leaf-blades not more than 15 cm. long.....12. *P. Ehrenbergii*.
 - E. Leaf-blades elliptic, acuminate or caudate-acuminate, loosely and inconspicuously reticulate (almost scalariform), chartaceous or subcoriaceous, rounded or obtuse toward the base, the extreme base narrowly cuneate; largest leaf-blades 18-20 cm. long.....13. *P. neurophylla*.
- C. Inflorescence longer than the leaves.
 - D. Subtriplinervation obscure; all axils glandular-pubescent; leaf-blades subcoriaceous, not more than 13 cm. long; branchlets glabrous at maturity.....2. *P. effusa*.
 - D. Triplinervation conspicuous; only lowermost axils glandular-pubescent; leaf-blades usually definitely coriaceous, 15-17 cm. long; branchlets fulvo-tomentellous, becoming glabrescent.....3. *P. costaricana*.
- A. Leaf-blades penninerved, never triplinerved or subtriplinerved.
- B. Largest leaf-blades 15-18-25 cm. long, never linear-lanceolate; leaves frequently subverticillate.
 - C. Base of leaf-blades cuneate, the apex caudate-acuminate; blades never more than 6 cm. broad, elliptic or lanceolate.....14. *P. chinantecorum*.
 - C. Base of leaf-blades obtuse, rounded or cordate or auriculate, the apex not caudate-acuminate.
 - D. Broadest part of the leaf-blade below the middle, the blades more or less attenuate toward the apex.
 - E. Leaf-blades glabrous, sessile and amplexicaul.....15. *P. amplexicaulis*.
 - E. Leaf-blades pubescent beneath, shortly petiolate.....16. *P. mollis*.
 - D. Broadest part of the leaf-blade at or above the middle.
 - E. Leaf-blades oblong, oblong-ovate, elliptic, obovate-elliptic, or obovate-oblong, never auriculate at the base, but obtuse, rounded or cordate or recurved.
 - F. Apex of the leaf-blades obtuse or rounded.
 - G. Inflorescence not more than 11 cm. long, pubescent or glabrescent; petioles usually 5 mm. long.....17. *P. Smithii*.
 - G. Inflorescence not less than 15 cm. long, glabrous or pubescent; petioles 1-2.5 cm. long.
 - H. Leaf-blades not more than 6 cm. broad and oblong-ovate or obovate-elliptic; inflorescence branching from the base, many-flowered and glabrescent.....18. *P. obtusata*.
 - H. Leaf-blades not less than 7-8 cm. broad, obovate; inflorescence not branched from the base, comparatively few-flowered and pubescent.....19. *P. Valeriana*.
 - F. Apex of the leaf-blades not obtuse or rounded.20. *P. helicterifolia*.
 - E. Leaf-blades elliptic, not more than 17 cm. long, auriculate at the base, rigidly coriaceous, above shining green, glabrous, loosely and conspicuously reticulate, beneath densely minutely appressed brightly ferruginous-tomentellous.....21. *P. Salvini*.
 - E. Leaf-blades elliptic, recurved at the base, up to 32 cm. long, the nervation tomentellous and areolate above, ferruginous-tomentose beneath.....22. *P. amplifolia*.
 - B. Largest leaf-blades usually not more than 13-14 cm. (rarely 15) cm. long; leaves never subverticillate.

- C. Leaf-blades obovate or elliptic.
 - D. Lower surface of the leaf-blades closely appressed-ferruginous-tomentellous, the base auriculate.....21. *P. Salvini*.
 - D. Lower surface of the leaf-blades not closely appressed-ferruginous-tomentellous, the base not auriculate.
 - E. Leaf-blades 13.5×5.5 cm.; apex abruptly and obtusely acuminate, glabrous.....23. *P. padiformis*.
 - E. Leaf-blades not more than 8×3 cm.; apex variable.....24. *P. psychotrioides*.
- C. Leaf-blades lanceolate, linear- or broadly lanceolate or elliptic, never obovate.
 - D. Leaf-blades attenuately linear-lanceolate, the largest not more than 2.3 cm. broad at most.
 - E. Leaf-blades glabrous; lateral nerves 5-7 pairs; branchlets glabrous or at most only slightly pubescent.....25. *P. chiapensis*.
 - E. Leaf-blades minutely pubescent beneath; lateral nerves 12-16 pairs; branchlets minutely pubescent.....26. *P. tampicensis*.
 - D. Leaf-blades not attenuately linear-lanceolate, the largest not less than 2.3 cm. broad.
 - E. Lateral nerves 7-11 pairs.
 - F. Leaves glabrous.....27. *P. pallescens*.
 - F. Leaves sericeous beneath.....28. *P. acuminatissima*.
 - E. Lateral nerves 3-5 pairs (7 at most).
 - F. Pubescence of branchlets and lower leaf-surface soft.
 - G. Largest leaf-blades not more than 2.3 cm. broad.....29. *P. mollicella*.
 - G. Largest leaf-blades not less than 2.7 cm. broad.....30. *P. Bourgeauviana*.
 - F. Pubescence of branchlets and lower leaf-surface rough; reticulation conspicuous throughout.....31. *P. Pittieri*.
- 1. *Phoebe Tonduzii* Mez in Bot. Jahrb. 30: Beibl. 67: 15. 1901; Standley in Field Mus. Publ. Bot. 18: 460. 1937.

DISTRIBUTION: Known only from the forests of central Costa Rica, at an altitude of 1800 m.

COSTA RICA: San José: Tree of the forests near El Copey, alt. 1800 m., Feb. 1898, *Tonduz 11735* (fl., ISOTYPE, Ch).

NATIVE NAME: "Aguacatillo blanco" (Costa Rica).

This species cannot be confused with any other known from this region, because of the minute mustard-yellow (ochraceous) tomentum clothing the young branchlets and the entire inflorescence. The leaves are similar to those of *P. costaricana*, but are not more than 10 cm. long and 4.5 cm. broad and of a yellowish green color above, paler and brownish beneath. They are heavily coriaceous, at first thinner and covered with yellowish pubescence which soon disappears, broadly elliptic, subcaudate-acuminate at the apex, cuneate at the base. The blades are strongly triplinerviate, the venation impressed above and prominently elevated beneath. The lateral veins number about 4 or 5 pairs, and the reticulation is more prominent beneath than above. The lowermost pair of lateral nerves bears in the axils densely pubescent glands. The inflorescence, with the flowers still in bud, consists of few-flowered axillary or subterminal panicles up to 13 cm. long clustered at the tips of long peduncles up to 8 cm. long. The flowers have thick hairy ovate lobes, the stamens of the two outer series with the elliptic mucronate anthers equalling the slender filaments. The stamens of the inner series bear two reniform stipitate glands at the base of

the filaments. The staminodia are broadly ovate, cordate, and sharply caudate-acuminate, equal in size to the stout pubescent stipes. The glabrous ovary is subglobose.

2. *Phoebe effusa* Meissner in DC. Prodr. 151: 33. 1864; Standley in Contr. U. S. Nat. Herb. 23: 295. 1922; Standley & Calderón, Lista Prelim. Pl. Salvador 85. 1925.

Persea effusa Hemsley, Biol. Centr. Am. Bot. 3: 71. 1882, non Benth.

Phoebe effusa γ *parvifolia* Meissner, l.c.

DISTRIBUTION: In forests of Mexico, in Vera Cruz and Michoacán, presumably very common, up to 2000 m. altitude.

MEXICO: Vera Cruz: About Vera Cruz and Jalapa, *Linden 13* (fl., SYNTYPE of *P. effusa* not seen), *14* (fl., SYNTYPE of *P. effusa* not seen, photo., GH), *78* (fl., SYNTYPE of *P. effusa* not seen, fragm., NY); Orizaba, in '1854, *Botteri 1039* (isosyntype of *P. effusa* γ *parvifolia*, NY); Mirador, *Liebmann 776* (*Lauraceae 44*) (fl., Ch); Totutla, *Liebmann* (*Lauraceae 48*) (fl., GH); Rancho & Barranca Remudadero, *Purpus 11163*, *14184* (fl., Ch); open forests and creek-banks, Zacuapán, *Purpus 14320* (fl., Ch), *16364* (fl., Ch). Michoacán: Mt. San Miguel, Tancitaro, *Leavenworth & Hoogstraal 1071* (fl., GH, NY).

NATIVE NAMES: "Pimento," "Canelito" (Standley, 1925).

This species is one which is difficult to separate from *P. costaricana*. In both of these species there is a triplinerviate condition of the leaves, which is, however, much more pronounced in *P. costaricana* than in *P. effusa*. The latter has faintly striate terete branchlets which are fulvo-tomentellous, becoming glabrescent with age. The branchlets of *P. costaricana* are striate, sulcate, or even angled, and become quite glabrous at maturity. The leaves of *P. effusa* are variable in shape and size, the blades chartaceous to subcoriaceous, 6–13 cm. (according to the original description) long and 2–5.5 cm. broad, the base cuneate, the apex obtuse or acute to caudate-acuminate or abruptly acuminate, all variations of the apex frequently occurring on the same sheet. The lateral nerves vary from 3–6 pairs, all of equal size and all bearing pubescent glands in their axils, or the lowermost may be subtriplinerviate. The blades are glabrous throughout except for the midrib, supported by slender, canaliculate, pubescent petioles usually up to 1 cm. in length. The leaves of *P. costaricana* are also variable, having thickly coriaceous blades which measure 8–17 cm. in length and 3–6 cm. in width, with about the same variation in the apex that occurs in the leaf-blades of *P. effusa*. The base of the leaf-blades of *P. costaricana* is more attenuately cuneate. The lateral nerves usually number 4 pairs, the lowermost pair often being extremely conspicuous and bearing pubescent glands in their axils, whereas the upper pairs are obscure and glandless. The petioles are usually stout, glabrous or glabrescent, and are up to 15 mm. in length. In both species under discussion the slender loosely flowered panicle glabrous inflorescences are usually longer than the leaves (up to 18 cm. long), and are borne on slender peduncles which make up at least half their entire length. There is a tendency for the pedicels of the flowers of *P. effusa* to be longer than the perianth; whereas those of *P. costaricana* are about equal to the perianth, rarely surpassing it. In spite of the closeness of the two entities, they seem to be separate species. No fruiting specimens are yet known of *P. effusa*.

3. *Phoebe costaricana* Mez & Pittier ex Mez in Bull. Herb. Boiss. II. 3: 230. 1903; Standley in Field Mus. Publ. Bot. 18: 459. 1937.

DISTRIBUTION: Known in Costa Rica, from the type-locality at 640–1200 m. altitude and in Alajuela, and in Chiriquí Province, Panama, at 1000–1700 m. altitude.

COSTA RICA: Puntarenas: Canas Gordas, alt. 1200 m., Feb. 1897, *Pittier 11107* (fl., ISOTYPE, GH, NY). Alajuela: Hills above Santiago, near San Ramón, *Brenes 14404* (fl., GH). PANAMA: Chiriquí: Bajo Mono, Boquete, *Davidson 583* (fl., A, Ch, Mo); forests about Boquete, *Pittier 2998, 3146* (fl., Ch); Finca Lérída to Boquete, *Woodson, Allen & Seibert 1099* (fr., A, Ch, NY, Mo).

NATIVE NAMES: "Sigua," "Sigua blanca" (Panama).

Under *P. effusa* there is a discussion of its relationship to *P. costaricana*. The fruiting specimens from Chiriquí show loose spreading infructescences that are still slender, bearing large ellipsoid definitely apiculate fruits about 2 cm. long and 1 cm. broad. The cyathiform or subhemispherical sometimes urceolate cupule bears the remnants of the enlarged persistent perianth-lobes. The enlarged tube is frequently constricted just below the lobes. The cupule is up to 9 mm. long, rarely 1 cm. in diameter at the widest portion (below the apex of the tube), and about 5 mm. deep, and the pedicel is 6–10 mm. long and expanded at the apex to 3 mm. in diameter.

4. *Phoebe Barbeyana* Mez in Jahrb. Bot. Gart. Berlin 5: 209. 1889; Standley in Contr. U. S. Nat. Herb. 23: 295. 1922.

DISTRIBUTION: Known only from the type-locality.

MEXICO: Vera Cruz: Near Orizaba, May 12, 1866, *Bourgeau 2436* (fl., fr., TYPE not seen, fragm. & photo., Ch, photo., NY); Orizaba, August 1866, *Bourgeau, s.n.* (fr., Ch).

This little known species bears branchlets that are yellowish-pubescent at the apex, becoming glabrous, brown and early angled, presently becoming terete. The leaves are subcoriaceous, elliptic, the base cuneate, the apex caudate-acuminate, glabrous above, somewhat shining, olive-green-brown, beneath opaque and glabrous except for the pubescent glands in the axils of the lowermost lateral nerves and sometimes the upper pairs. The leaves are penninerved, with a subtriplinerviate condition obscure on the upper surface but very conspicuous beneath. The lateral nerves number 3–5 pairs and are more or less obscure above but delicately prominent beneath, the lowermost pair being the most conspicuous. The costa is impressed above and more prominent beneath. The blade, 8–11 cm. long and 3.6–4.5 cm. broad, is subtended by a canaliculate minutely pubescent petiole up to 9 mm. long. Mez described the inflorescence as glabrous and subracemose-paniculate, shorter than the leaves. The flowers are glabrous with a short perianth-tube. The ovate acute outer lobes are slightly shorter than the inner. The glabrous filaments are one-third shorter than the anthers, which are broadly ovate, rounded at the apex, manifestly constricted at the margin over the lower cells. The staminodia are very large, broadly cordate, acuminate, glabrous with pilose stipes. The ovary is glabrous, subglobose, attenuate into a style which is almost longer, thick-cylindrical at the apex, with a subdiscoid obtuse stigma. The fruit, thickly ellipsoid, measures 11 mm. long and 8 mm. in diameter, and is seated on the lobes of the perianth, distended at the base, and the subhemispherical thickened pedicel.

Phoebe Barbeyana seems to be related to *P. neurophylla*, from Costa Rica, but has much smaller though more coriaceous leaves. The fruits of the two species are not unlike.

5. *Phoebe Brenesii* Standley in Field Mus. Publ. Bot. 18: 459. 1937.

DISTRIBUTION: Central Costa Rica at 600–1000 m. altitude, and in Chiriquí Province, Panama, at 1140 m. altitude.

COSTA RICA: Alajuela: Near San Ramón, *Brenes* 377 (538) (fl., Ch); Piedades near San Ramón, *Brenes* 4896 (fr., Ch); "San Pedro," near San Francisco de San Ramón, *Brenes* 6675 (fl., Ch); La Palma de San Ramón, *Brenes* 6810 (fl., Ch); between San Miguel and La Palma de San Ramón, Feb. 14, 1933, *Brenes* 17048 (fl., TYPE, Ch); Atenas, in Pacific tropical zone, in open pasture, clay-loam, *A. Smith* P.2445 (fl., A). PANAMA: Chiriquí: Boquete, *Davidson* 641 (fr., A, Ch, Mo).

This tree has slender angled branchlets that early lose their fulvo-tomentellous pubescence and become striate and glabrescent. The coriaceous elliptic or oblong-elliptic (rarely broadly-elliptic) abruptly acuminate or caudate-acuminate leaves are triplinerved and except for the pubescent venation become glabrous very early. They are borne on slender glabrous petioles up to 2.5 cm. long, and they are up to 10 cm. long and 4 (–5) cm. broad. They bear axillary pubescent glands in the lowermost pair of lateral nerves. The inflorescence is loosely paniculate, glabrous or glabrescent, up to 12 cm. long, and usually shorter than the leaves. The peduncles are slender, glabrous, and not more than 7 cm. long. The glabrous flowers are about 3.4 mm. long, borne on pedicels \pm 2 mm. long. The ovate perianth-lobes are thinnish and \pm 2.5 mm. long. The two outer series of stamens measure \pm 1.7 mm. long, the oblong somewhat emarginate anthers being twice the length of the slender filaments. The inner stamens, \pm 2.15 mm. long, with their more narrow anthers equalling the filaments, bear two reniform stipitate glands near the base of the filaments that almost equal the anthers in length. The cordate staminodia are \pm 1.4 mm. long, the pubescent stipes being almost one-half the entire length. The glabrous gynaeceum, measuring \pm 2.4 mm., consists of a subglobose ovary topped by a stout style slightly longer than the ovary and bearing a conspicuous capitate stigma. The fruit is oblong-ellipsoid, 12×5 cm., seated in a shallow cupule 5 mm. long and 5 mm. broad at the apex and 2 mm. deep, the remnants of the partially deciduous perianth-lobes forming the shallow cupule. The pedicel is thickened and up to 5 mm. long, expanding slightly toward the apex.

This species is similar to *P. mexicana* in foliage, but is at once separated by the loose spreading inflorescence. *P. mexicana* having a more spike-like strict panicle. It also recalls *P. costaricana*, but the leaves are much smaller, and the inflorescence less heavily flowered as well as shorter.

6. *Phoebe longipes* Johnston in Contr. Gray Herb. n.s. 70: 69. 1924.

DISTRIBUTION: Mexico, known only from the type-locality.

MEXICO: Puebla: Along the river near Honey Station (Trinidad), May 6, 1904, *Pringle* 8829 (fl., TYPE, GH).

This species belongs with the triplinerved group with inflorescences shorter than the leaves, but it could never be confused with any other known species in this complex. The entire plant seems to be glabrous, except for the suggestion of pubescence in the axils of the lowermost pairs of lateral nerves. The branchlets are conspicuously alate and expanded at the nodes, with a glaucous bloom which early disappears. The leaf-blades are pale green above, paler beneath, the reddish brown venation frequently standing out in contrast, like the petioles, branchlets, peduncles, and pedicels. The blades are lanceolate or oblong or narrowly ovate-lanceolate, the

tips falcate-acuminate or caudate-acuminate, the bases cuneate or rounded (rarely), measuring 12–22 cm. long and 4–5.5 cm. broad. The lateral veins, except for the lowermost pairs which are triplinerved, are rather inconspicuous, numbering up to 6 pairs. The reticulation is obscure above but conspicuous and almost areolate beneath. The petioles are sturdy enough, early glaucous, and measure up to 2.5 cm. The few-flowered very slender inflorescences are axillary, up to 7 cm. long, borne on filiform peduncles up to 3 cm. long. The flowers, also with a pruinose bloom, are campanulate, almost 5 mm. long, borne on slender filiform pedicels frequently as long as 1.5 cm. The perianth-lobes are thin, membranaceous, ovate, acute, \pm 2.8 mm. long. The stamens of the two outer series are \pm 2.8 mm. long, and consist of slender filaments pubescent at the base and somewhat longer than the ovate obtuse anthers. The stamens of the inner series (\pm 2.6 mm. long) bear two large conspicuous basal glands which equal the oblong obtuse anthers. The filaments are about one and one-third the length of the entire stamens. The staminodia are triquetrous and conspicuous, about 1.25 mm. long overall, borne on stout stipes that are pubescent and equalling one-half the entire length. The glabrous gynaeceum measures \pm 3 mm. The ovoid-ellipsoid ovary about equals the slender style, which is topped by a conspicuously three-parted stigma.

7. *Phoebe subtriplinervia* (Meissner) Standley in Contr. U. S. Nat. Herb. 23: 294. 1922.

Oreodaphne subtriplinervia Meissner in DC. Prodr. 15¹: 125. 1864.

Ocotea subtriplinervia Hemsley, Biol. Centr. Am. Bot. 3: 74. 1882.

Phoebe Galeottiana Mez in Jahrb. Bot. Gart. Berlin 5: 200. 1889.

DISTRIBUTION: Known only from the syntypes, from Mexico.

MEXICO: Vera Cruz: Near Jalapa, *Galeotti* 7061 (fl., fragm. of ISOSYNTYPE of *Oreodaphne subtriplinervia*, NY); Mirador, *Linden* 17 (fl., SYNTYPE of *O. subtriplinervia* not seen).

According to the original description, this is a very glabrous species. The single leaf available is coriaceous, lanceolate, acuminate, obscurely subtriplinerviate, and with the exception of the more prominent costa, slightly elevated above and very conspicuously so beneath, the venation is everywhere of about the same size and prominence. The blade is glabrous throughout except for the pubescent axillary glands of the lowermost lateral nerves. The margin is undulate and the blade is up to 6.5 cm. long and 1.5 cm. broad, the broadest portion below the middle. It is subtended by a slender canaliculate glabrous petiole up to 1 cm. long. The entire blade throughout is prominently reticulate. Meissner describes the racemes as axillary and subterminal, about 2.5 cm. long, 5-flowered, with nodding pedicels (peduncles?) up to 6.5 mm. long. The white or yellow flowers are 1 line long, and the lobes of the perianth are deciduous. From the cited fragment of the *Galeotti* number, I find the flower to be about 2 mm. long, supported by a slender almost glabrous pedicel nearly twice its length. The broadly ellipsoid perianth-lobes are \pm 1.7 mm. long and thickish, with a suggestion of papillae near the apex. The two outer series of stamens are \pm .8 mm. long, the almost square anthers nearly once and a half times the length of the fairly slender filaments. The stamens of the inner series are 1 mm. long and bear at the base of the filaments two very conspicuous and spreading sessile glands. The gynaeceum is glabrous, \pm 1.25 mm. long, consisting of a scarcely stipitate subglobose ovary equalling the taper-

ing style, which is capped with an inconspicuous stigma decurrent down one side of the style.

With the scanty material at hand it is impossible to say with certainty what the affinity of the entity may be. Possibly it is somewhere near *P. salicifolia* or its allies.

8. *Phoebe salicifolia* Nees in Linnaea 21: 488. 1848; Standley in Contr. U. S. Nat. Herb. 23: 295. 1922.

Persea salicifolia Hemsley, Biol. Centr. Am. Bot. 3: 72. 1882.

DISTRIBUTION: Central Mexico; very little material available.

MEXICO: State unknown, near Regla, *Ehrenberg* 875 (fl., fragm. of TYPE, Ch); Hidalgo: Jacala, in deep ravine, *Chase* 7311 (fr., Ch, GH, NY).

This species, so little known, has branchlets that become glabrescent and are first somewhat angled, later terete and finely striate. The leaves are lanceolate to oblong-lanceolate, acuminate or subacute, subtripplinerved, glabrous above except for the costa, subcoriaceous, glaucous, pale green in dried state, paler beneath, the blades up to 9 cm. long and 2 (-3.2) cm. broad. The reticulation is minute, the veins deeply impressed above and prominently elevated beneath. The costa is impressed above and conspicuously elevated beneath. The 4 or 5 pairs of lateral nerves are inconspicuous above and slightly more conspicuous beneath, except for the long lowermost pair, in the axils of which are pubescent glands. The inflorescence is not more than 4 cm. long, slender, glabrous, axillary, with a long peduncle, few-flowered. The flowers are glabrous, campanulate, up to 3.3 mm. long, with a slender pedicel \pm 4.25 mm. long. The ovate perianthlobes measure \pm 2.15 mm. long and are thinnish and hairy inside near base. The two outer series of stamens measure \pm 1.25 mm., the oblong mucronate anthers equalling the slender filaments. The stamens of the inner series are slightly longer, \pm 1.5 mm., and bear two reniform short-stipitate glands at the base of the filaments almost the length of the anthers. The staminodia are \pm 1 mm. long, triangular, with pubescent stipes more than half the entire length of the staminodia. The gynaecium is glabrous, \pm 1.7 mm. long, the globose ovary not quite equalling the slender style in length. The stigma is conspicuous, almost peltate. The fruit is subglobose-ellipsoid and dark purple in the dried state, 13×10 mm., and seemingly slightly stipitate. It is seated on a cupule which is infundibuliform and measures 6 mm. long and 6 mm. broad at the apex. The pedicel is thickened and about 4-5 mm. long. The perianthlobes, persisting at the apex of the shallow cupule for about 2 mm. in depth, presently break off irregularly, leaving a flat disk to which the stipe of the fruit is attached.

The nearest relatives of the species are *P. areolata* and *P. Arsenei*. Their differences will be discussed under the latter species.

9. *Phoebe areolata* Lundell in Contr. Univ. Mich. Herb. 7: 13. 1942.

DISTRIBUTION: In the mountains of Mexico and in British Honduras.

MEXICO: Chiapas: Saxchanal, Sierra Madre, alt. 2700 m., July 1, 1941, *Matuda* 4296 (fl., A, TYPE—Mich, NY). BRITISH HONDURAS: Stann Creek: Mountain ridges, 19 mile, Stann Creek Valley, *Schipp* 971 (fr., Ch, GH, NY); Pine Peak, Cockscomb branch of South Stann Creek, *Stevenson* XII, XVI (fl., Ch).

Outstanding are the glabrous conspicuously areolate ovate-lanceolate leaves of this species. The blades are rounded at the base and acuminate at the apex, up to 11 cm. long and 4 cm. broad, supported by glabrous

canaliculate petioles up to nearly 1 cm. long. The costa is slightly impressed, but brownish and conspicuous against the green blade above, and the lateral nerves are obscure. Beneath both are elevated. The lateral nerves are 4-6 pairs, all bearing pubescent glands in their axils, the lowermost pair simulating a triplinerviate condition. The axillary rather few-flowered panicle inflorescences, up to 12 cm. long, are very sparsely pubescent, and are borne on rather slender reddish brown peduncles up to 7 cm. long. The campanulate flowers, about 3.5 mm. long, are subtended by long (7 mm.) pedicels and the ovate lobes are fairly fleshy. The two outer series of stamens are ± 1.9 mm. long, the ovate apiculate anthers being only slightly shorter than the filaments. The anthers of the inner series of stamens, which measure ± 2.15 mm., are oblong, and the filaments bear two small subbasal stipitate glands. The ovate acuminate staminodia are ± 1 mm. long, with pubescent thick stipes somewhat less than half the entire length. The glabrous ellipsoid ovary nearly equals the style, which is crowned by a conspicuous peltate stigma.

The closest affinities of the species are with *P. salicifolia* and *P. Arsenei*. A discussion will be found under the latter species.

10. *Phoebe Arsenei*, sp. nov.

Arbor, ramulis fulvo-tomentosis deinde glabrescentibus valde striatis. Folia alternata, petiolis fulvo-tomentosis canaliculatis ad 1.3 mm. longis et 1.5 mm. latis, laminis juventute utrinque molliter pubescentibus mox supra glabris nitidis subtus molliter pubescentibus, subcoriaceis, in sicco pallide viridibus vel viridi-brunneis, ellipticis, ad 13 cm. longis et 4 cm. latis. basi cuneatis vel leviter obtusis, apice acuminatis vel obtuse acuminatis raro emarginatis, penninerviis vel subtriplinerviis, costa supra impressa pubescente subtus elevata, nervis lateralibus 5-7 paribus leviter elevatis, rete venularum supra minuto et valde impresso, subtus conspicue prominulo. Inflorescentia axillaris et subterminalis paniculata ad 10 cm. longa, glabra, pauciflora, longipedunculata, pedunculo gracili ad 7 cm. longo leviter pruinoso. Flores ad 3 mm. longi, brevipedicellati, pedicellis ad 2.5 mm. longis gracilibus, perianthio campanulato, lobis ovatis acutis membranaceis, ± 2.15 mm. longis ad basin incrassatis; staminibus ser. I & II ± 1.1 mm. longis, antheris ovato-ellipticis obtusis filamentis crassis pubescentibus duplo longioribus, ser. III ± 1.7 mm. longis biglandulosis, glandulis reniformibus stipitatis antheris oblongis emarginatis aequalibus; staminodiis ovatis membranaceis brevistipitatis, basi pubescentibus, ± 1 mm. longis; gynaeceo glabro ± 1.9 mm. longo, ovario subgloboso stylo subaequali, stigmate subcapitato conspicuo. Fructus ignotus.

DISTRIBUTION: Known only from the type-locality.

MEXICO: Michoacán: Vicinity of Morelia, Rincón, alt. 1950 m., April 11, 1909, *Arsène* 2448 (fl., TYPE — GH, NY).

This species seems to be very near *P. areolata* and *P. salicifolia*. It is separated from the former by its softly pubescent lower leaf-surface and branchlets and its conspicuously reticulate lower leaf-surface. *Phoebe areolata* is practically glabrous throughout, the axils of the very prominent triple-nerves at the base show conspicuous pubescent glands, and the blades are conspicuously areolate. The shorter inflorescence and leaves of *P. salicifolia* separate the two species.

11. *Phoebe mexicana* Meissner in DC. Prodr. 151: 31. 1864; Standley in Contr. U. S. Nat. Herb. 23: 294. 1922, in Trop. Woods 21: 17. 1930, in Field Mus. Publ. Bot. 10: 201. 1931; Standley & Record in op. cit. 12: 144. 1936; Standley in op. cit. 18: 459. 1937; Yunker in op. cit. 9: 290. 1940.

Persea cinnamomifolia Hemsley, Biol. Centr. Am. Bot. 3: 71. 1882, non H.B.K.

Phoebe mexicana var. *Bourgeauana* Mez in Jahrb. Bot. Gart. Berlin 5: 214. 1889.

DISTRIBUTION: Generally throughout southwestern Mexico and Central America, at varying altitudes from 15 m. along the coast to 2800 m. in the mountains of Guatemala.

MEXICO: Vera Cruz: In the valley of the city of Cordoba, April 20, 1866, *Bourgeau* 2302 (fr., isotype of *P. mexicana* var. *Bourgeauana*, Ch); Fortuño, Coatzacoalcos River, *L. Williams* 8920 (fr., A, Ch, NY), 9142 (sterile, A); near Jalapa, *Galeotti* 7026 (SYNTYPE of *P. mexicana* not seen); Mirador, *Linden* 20 (fl., SYNTYPE of *P. mexicana*, fragm. & photo., Ch, photo., NY), *Liebmänn Lauraceae* 70 (fl., NY), 71 (fl., GH), 75 (fl., Ch), 77 (fl., GH); Zacuapán, rocky plains, *Purpus* 5991 (fl., GH), 14328 (fl., Ch). Oaxaca: Vicinity of Cafetal Concordia, *Morton & Makrinius* 2444 (young fruit, Ch). Chiapas: Escuintla, *Matuda* 1082, 2632 (fl., A, NY). GUATEMALA: Huehuetenango: Cerro Cananán, between Nucapuxlac and Cananán, Sierra de los Cuchumatanes, *Steyermark* 49045 (fr., Ch). Retalhuleu: Vicinity of Retalhuleu, *Standley* 88624 (fl., Ch). HONDURAS: Comayagua: River bank on plains near Siguatepeque, *Yunker, Dawson & Youse* 5811 (fr., GH). Tegucigalpa: Mont. de la Flor, pine and oak region near river, *C. & V. W. von Hagen* 1227 (sterile, NY). Yoro: Subirana, in open semi-tropical valley, *C. & V. W. von Hagen* 1051 (sterile, NY); vicinity of Coyoles, in the Aguan River valley, *Yunker, Koepper & Wagner* 8630 (fr., Ch, GH, NY). Atlántida: In deep forest near Lancetilla, *Yunker* 4945 (fr., Ch). BRITISH HONDURAS: El Cayo: Opposite Vaca on hillside, *Gentle* 2499 (fl., A, NY). Stann Creek: Middlesex, along creek in broken ridge, *Gentle* 2941 (fr., A, NY); Big Eddy Ridge, in broken ridge, *Gentle* 3549 (fr., A, NY). Toledo: Hope Creek, along river-bank, *Schipp* 281 (fr., Ch, GH, NY). COSTA RICA: San José: Near the River Virilla, on old trail from Heredia to San José, *Brenes* 20560 (fr., Ch); between the graveyard Calvo and the Río María Aguilar, *Rojas* 404 (fl., Ch); vicinity of El General, *Skutch* 4042 (fr., A, NY); vicinity of San José, *Standley* 47344 (fl., Ch). Alajuela: Atenas, in Pacific tropical zone in clay-loam pasture, *A. Smith* P.2440 (fl., A); Alajuela, in the mountains, *Torres* 115 (fl., Ch). PANAMA: Canal Zone: Near Culebra, *Pittier* 3438 (fl., GH); hospital grounds at Ancon, *Pittier* 3957 (fr., GH).

NATIVE NAMES: "Aguacatillo" (Honduras, Costa Rica); "Aguacate negro" (Honduras); "Boy Job," "Wild Pear" (British Honduras).

This species is distinct because of the numerous strict raceme-like panicles with very short branchlets which are borne so close to the main axis as to give a spike-like appearance to the panicles. The branchlets are reddish black and sulcate, becoming striate and glabrous at maturity. The leaf-blades are coriaceous with varying degrees of pubescence, usually entirely glabrous above and often so beneath except for the pubescent glands in the axils of the lower pair of lateral nerves. The blades are elliptic, lanceolate or oblong-lanceolate, cuneate at the base or somewhat obtuse or rounded, usually acuminate to caudate-acuminate at the apex, up to 15 (-26) cm. long and 5 (-10) cm. broad. The margin is very often slightly undulate, and the costa is impressed above and very prominently elevated beneath. The lateral nerves are except for the lowermost pair rather obscure, less so beneath than above, and they number up to 7 pairs. The lowermost are conspicuous and diverge from the costa at an angle of about 25°, ascending nearly to the middle of the blade before reaching the margin. The uppermost pairs diverge at an angle of about 55°. The petioles are stout, canaliculate, glabrescent to glabrous, and measuring up to 2 cm. in length.

The numerous inflorescences are many-flowered, pubescent to glabrescent, reddish, with peduncles not more than 5 cm. and usually much less in length. The small white flowers are sessile to shortly pedicellate and fulvous-pubescent. The flowers are 3–4 mm. long, campanulate, with perianth-lobes thin, ovate, and ± 2.6 mm. long. The stamens are ± 2.15 mm. long, the slender filaments about equalling the elliptic anthers. The filaments of the inner series of stamens bear two subreniform stipitate glands at their bases, equalling about one-third the entire length of the stamens. The glabrous gynaecium, ± 2.6 mm. long, consists of a subglobose to obovate substipitate ovary topped by a slender style one and a third times longer than the ovary. The stigma is conspicuous, dilated, and discoid. The glabrous fruits are slightly obovoid, apiculate, about 1 cm. long and 7 mm. broad, seated on a glabrous cupule that is campanulate, about 5 mm. long, 7 mm. broad, and ± 2 mm. deep, which bears the rather brittle remains of the perianth-lobes. The pedicel is enlarged somewhat to about 5 mm. long.

The variety, according to Mez, differs from the species in bearing leaf-blades which are always obtusish at the base, perianth-lobes which remain erect in fruit, pedicels less thickened, and fruits that are definitely subglobose, 8 mm. long and 6 mm. broad. This variation does not seem to warrant a varietal status. To my mind it is merely another manifestation of the species proper.

12. *Phoebe Ehrenbergii* Mez in Jahrb. Bot. Gart. Berlin 5: 201. 1889; Standley in Contr. U. S. Nat. Herb. 23: 294. 1922.

Phoebe Hartmanii Johnston in Contr. Gray Herb. n.s. 70: 69. 1924.

DISTRIBUTION: Known only from northwestern and central Mexico, 450–1960 m. altitude, in arroyos.

MEXICO: Sonora: Arroyos of the tropical Sonoran regions, Vinata, Río Mayo, *Gentry* 1478 (fr., A, Ch); deep canyon-bottom in short-tree forest, Arroyo Gochico, Río Mayo, *Gentry* 3629 (fl., A, Ch), 3630 (fr. & young fr., A, Ch). Chihuahua: Batopilas, April, 1892, *Hartman* 1029 (fl., young fr., isotype of *Phoebe Hartmanii*, Mo); Ocampo River, Río Mayo headwaters, *LeSueur* 1246 (abnormal fl., Ch, GH). Sinaloa: *Ortega* 4617 (abnormal fl., Ch). Jalisco: Arroyo de los Hornos, Hacienda del Ototal, w. of San Sebastian, Sierra Madre Occidental, common along stream-side, *Mexia* 1803 (fr., A, Ch, GH). Mexico: Temascaltepec, *Ehrenberg* 712 (fl., fragm., TYPE of *P. Ehrenbergii*, Ch, photo., Ch, NY); Rincón, *Hinton* 378 (abnormal fl., GH, NY), 3032 (abnormal fl., GH); Ypericones, *Hinton* 3895 (abnormal fl., fr., GH); Berros, *Hinton* 5771 (fl., fr., GH); Carboneras, *Hinton* 6826 (abnormal fl., GH).

NATIVE NAMES: "Aguacatillo" (Mexico); "Bebelama" (Sonora).

Some of the cited specimens have been placed in *Persea*, and many sheets have also been identified as *Sassafridium macrophyllum*, the type of which is none other than the widespread *Nectandra globosa*. An examination of the type-material of the two species *P. Ehrenbergii* and *P. Hartmanii* seems to place the entity in the triplinerved group of *Phoebe*.

The entire tree seems to be glabrous, the young branchlets striate, somewhat angled, losing their early tomentellous condition. The elliptic or occasionally oblong leaf-blades are pale green, chartaceous, glabrous, measuring up to 15 cm. long and 4–5 cm. broad. They are usually cuneate at the base, occasionally obtuse, and the apex is acute or acuminate. The midrib and lowermost lateral nerves are more conspicuous than the delicate upper lateral nerves, which number as many as 5 pairs. The minute reticulation

is obscure on the upper surface and less so on the lower. The inflorescence is slenderly paniculate, up to 12 cm. long, few-flowered, and more or less pruinose. The somewhat pruinose flowers are nearly 5 mm. long, subtended by slender pedicels of equal length or slightly longer. The subequal perianth-lobes are elliptic, thin, slightly pubescent at the inner surface near the base, and ± 2.8 mm. long. The stamens are ± 1.7 mm. long, the ovate or oblong anthers equalling the stoutish filaments. Those of the inner series bear two reniform sessile glands at the base about one-third the length of the entire stamen. The staminodia are nearly sessile, ovate, cordate, and ± 0.8 mm. long. The glabrous gynaecium is 2.5–3 mm. long, the globose ovary being about $\frac{2}{3}$ the entire length. The slender style is topped by a conspicuous capitate stigma. The fruit is ellipsoid, minutely apiculate, measuring 12×8 mm., subtended by a shallow spreading reddish pruinose cupule 4–6 mm. long and 8 mm. broad at the flat disk-like apex. The pedicel is about 3 mm. long and slightly enlarged. The perianth-lobes approaching anthesis develop an abscission layer about one-half their length, and the upper half is early deciduous. The lower portion of the lobe persists well into the fruiting stage, and finally when the fruit is mature falls off. The specimens from Jalisco are somewhat like *P. longipes* in leaf-shape, and possibly may eventually prove to be the fruiting stage of that species. More material is needed to be able to determine this, however.

13. *Phoebe neurophylla* Mez & Pittier ex Mez in Bull. Herb. Boiss. II. 3: 231. 1903; Standley in Field Mus. Publ. Bot. 18: 460. 1937.

DISTRIBUTION: Costa Rica, in forests and on river-banks at varying altitudes up to 1900 m. Possibly in Mexico at very low altitudes.

MEXICO: Oaxaca: (?) In llanos, Tuxtepec, Chiltepec, and vicinity, *Martínez-Calderón* 119 (fl., A). COSTA RICA: Puntarenas: On the banks of the River Hur, valley of the Diquis, alt. 800 m., March 15, 1898, *Pittier* 12054 (fr., ISOTYPE, US) (small tree). Alajuela: Continental divide 2 miles n.w. of Zarcero, at edge of forest in rich humus, *A. Smith* 142 (fl., Ch). San José: Vicinity of El General, *Skutch* 3844 (fl., A, NY), 4329 (fr., A, Ch, NY).

This species is very near *P. costaricana* in vegetative characters. The chartaceous to coriaceous elliptic leaf-blades, rounded or obtuse toward the base, the extreme base narrowly cuneate, the apex acuminate or acuminate-caudate, up to 21 cm. long and 7 (–8) cm. broad, are glabrous except for the distinctly pubescent glands in the axils of the lowermost pair of lateral nerves. The upper pairs of lateral nerves are obscure, numbering 3 or 4 and obscurely camptodromous, giving the impression of a typically triplinerviate leaf. Transverse venation is usually fairly inconspicuous. The axillary and subterminal inflorescence, unlike that of *P. costaricana*, is short, not longer than 6 cm., and is glabrous throughout and comparatively few-flowered, with peduncles not more than 2 cm. long. The whitish campanulate flowers are about 4 mm. long, the thin ovate acute lobes almost equalling the tube, and are subtended by slender filiform pedicels up to 5 mm. long. The two outer series of stamens are approximately 1.9 mm. long, the rounded ovate anthers almost as long as the slender filaments. The inner series measure ± 2.15 mm. long, the large conspicuous glands almost equalling one-half the length of the entire stamens. The large conspicuous staminodia are subcordate, ± 1.25 mm. in length, the thick stipes equalling one-half the entire length. The glabrous gynaecium is about 3 mm. long, the style one and one-third times the length of the subglobose

ovary. The stigma is spreading, discoid, and conspicuous. The fruit is a green ellipsoid apiculate berry, 18×12 mm., subtended by a flaring shallow red cupule, more or less minutely rugose, with an entire margin. The cupule is less than 5 mm. long, 1.3 cm. in diameter, and not more than 2–3 mm. deep. The enlarged pedicel is up to 12 mm. long and is expanded to 5 mm. at the apex.

14. *Phoebe chinantecorum* Schultes in Bot. Mus. Leaflet. Harvard Univ. 9: 170. 1941.

DISTRIBUTION: Known only from the type-locality.

MEXICO: Oaxaca: Dark forest, San Juan Lalana, Choapam, alt. 550 m., May 8, 1939, *Schultes & Reko* 827 (fl., ISOTYPE, GH) (small slender weak tree).

NATIVE NAME: "Mo-gwu" (Oaxaca).

This little known species has slender branchlets, as well as petioles, clothed with a dense ferruginous tomentum, the former bearing at the apex a subverticillate whorl of large elliptic or lanceolate-elliptic chartaceous leaves slightly petiolate or subsessile, cuneate at the base and caudate-acuminate at the apex. The blades measure up to 20 cm. in length and 6 cm. in width, the upper surface shining and glabrous except for the pubescent costa, the lower densely pubescent on the venation. The few-flowered subpyramidal panicle inflorescences are up to 6.5 cm. long (or more?), the slender pubescent peduncle up to 4.5 (–6) cm. The campanulate flowers are about 3.5 mm. long, equalling the slender glabrescent pedicels. The oblong lobes are fleshy, ± 2.5 mm. long. The somewhat petaloid stamens of the two outer series measure ± 1.25 mm.; the anthers are subsessile and more or less oblong, the connective tissue occupying the upper third of the anthers. Those of the inner series have anthers obovate, longer than the stout pubescent filaments bearing two sessile glands equalling them in length. The staminodia are cordate, ± 0.7 mm. in length, the stipes almost the entire length. The glabrous gynaecium is ± 1.5 mm., the ovoid or subglobose ovary shortly stipitate and bearing a short thick style with the subcapitate stigma at its apex.

Very probably the species is but a variation of the widespread *P. helicterifolia*. Further collections may show a line of development toward this type.

15. *Phoebe amplexicaulis* (Schlechtendal & Chamisso) Mez in Jahrb. Bot. Gart. Berlin 5: 216. 1889; Standley in Contr. U. S. Nat. Herb. 23: 293. 1922.

Persea amplexicaulis Schlechtendal & Chamisso in Linnaea 5: 90. 1830; Nees, Syst. Laurin. 137, 672. 1836 (excl. var.), in Linnaea 21: 490. 1838; Meissner in DC. Prodr. 15¹: 54. 1864 (excl. var.); Hemsley, Biol. Centr. Am. Bot. 3: 71. 1882.

DISTRIBUTION: Known only from the mountains of Mexico.

MEXICO: Mexico: Cerro Colorado, in mountains, *Schiede & Deppe* 87 (fr., TYPE of *Persea amplexicaulis* not seen, photo., GH).

The single collection of this species may very possibly be a fruiting specimen of *P. mollis* which has become glabrous with age. The variation of leaf-base shape in this complex is so great that one might reasonably expect to find within a species sessile amplexicaul leaves grading into shortly petiolate cordate leaves. Until the type of *P. amplexicaulis* is available for direct comparison, I shall maintain it as a distinct species.

Schlechtendal and Chamisso describe the leaf-blades as glabrous, coriaceous, as opposed to those of the latter species *P. mollis*, subsessile, oblong,

cordate-amplexicaul at the base, long-acuminate into an obtuse acumen with a slight margin. The leaves measure nearly 12 cm. long and about 2 cm. broad. The axillary few-flowered cymes are long-pedunculate, with the peduncles filiform, the entire cymes measuring nearly 6.5 cm. long. The fruit is less than 1 cm., and the flowers unknown.

16. *Phoebe mollis* Mez in Jahrb. Bot. Gart. Berlin 5: 192. 1889; Standley in Contr. U. S. Nat. Herb. 23: 293. 1922.

DISTRIBUTION: Known only from Mexico and western Guatemala at 1300–2100 m. altitude.

MEXICO: Without locality, *Haenke s.n.* (fl., TYPE not seen), possibly an isotype (labeled 1562 in Ch). GUATEMALA: San Marcos: Above Finca El Porvenir, on "Todos Santos Chiquitos," lower south-facing slopes of Volcán Tajumulco, *Steyermark 37201* (fl., Ch). Suchitepéquez: Upper forested slopes of barranco by Loma Grande, above Finca El Naranjo, on Volcán Santa Clara, *Steyermark 46854* (fl., Ch).

Phoebe mollis is near *P. amplexicaulis* in leaf-shape, and eventually, with more material for study, may prove to be a flowering specimen of that species. The branchlets are heavily fulvous-tomentose. The coriaceous or subcoriaceous leaf-blades are oblong-lanceolate, rounded or cordate at the base, and long-acuminate at the apex, measuring up to 18 cm. long, although usually 10–15 cm., and 5–6 cm. broad, subtended by stout tomentose petioles up to 1 cm. long. The impressed costa is visible above and frequently tomentose; the lateral nerves are obscure and number upwards of 10 pairs, diverging at an angle of 60–80°, and are inconspicuous like the reticulation. Beneath, the costa and lateral nerves are conspicuously elevated and tomentose, and the reticulation for the most part prominent. The slender few-flowered panicle inflorescence is early heavily fulvous-tomentose, later becoming glabrescent. The slender peduncle is up to 8 cm. long. The pubescent flowers are about 3 mm. long with pedicels \pm 1.7 mm. Their perianth-lobes are broadly rotund-ovate, subacute, rather thick and \pm 1.7 mm. long. The rotund-ovate anthers of the two outer series of stamens are about twice the length of the filaments, the entire length being \pm 1 mm. long. Those of the inner series are more or less obtusely ovate, with two sessile basal glands the length of the filaments. The original description mentions sagittate stipitate staminodia. The flowers I have dissected are not fully developed and show at most thin strap-shaped structures. The glabrous ovary is topped by a short style and more or less inconspicuous stigma.

17. *Phoebe Smithii*, sp. nov.

Arbor ad 15 m. alta, ramulis sulcatis dense fulvo-tomentosis vel glabrescentibus. Folia alternata vel subverticillata, juventute membranacea plus minusve molliter pubescentia, mox coriacea et sparse pubescentia dense praesertim nervationibus, petiolis robustis dense fulvo-pubescentibus ad 5 mm. longis, laminis ellipticis vel obovatis vel oblongo-ellipticis, 11–15 (–20) cm. longis et 5–6 (–8) cm. latis, basi cordatis, obtusis, vel rotundatis, apice rotundatis, obtusis, vel obtuse subacuminatis, penninerviis, costa supra leviter subtus conspicue elevata, nervis lateralibus 8–10-paribus supra leviter subtus prominule elevatis, angulo 35–45° divergentibus, rete venularum supra obscuro subtus laxo et conspicuo. Inflorescentia axillaris et subterminalis paniculata, pedunculo et rhachi satis pubescentibus, ramulis ultimis et floribus glabris glaucis. Flores magni 5–6 mm. longi et 15 mm.

diam., pedicellis gracilibus ad 7 mm. longis; perianthii lobis ellipticis carnosus intus papillois ad 4.5 mm. longis; staminibus ser. I & II \pm 1.9 mm. longis, filamentis brevibus, antheris subreniformibus et subpetaloideis; staminibus ser. III antheris subrectangularibus filamentis conspicue biglandulosis aequantibus; staminodiis conspicuis ovatis brevistipitatis, \pm 1 mm. longis; gynaeceo glabro \pm 2.5 mm. longo subgloboso ovario brevistipitato stylo subaequali; stigmatibus conspicue discoideo. Fructus ellipsoideus minute apiculatus 3 cm. longus et 1.8 cm. latus, cupula hemisphaerica 1 cm. longa et 1.5 cm. diam. et 6 mm. alta subtentus, pedicello robusto 8 mm. longo et utrinque 4 mm. diam.

DISTRIBUTION: Known only from Alajuela and San José in Costa Rica, at 1800–2200 m. altitude.

COSTA RICA: Alajuela: Hills above Baranca de Zarcero, at edge of forest, March 22, 1938, *A. Smith P.C. 367* (fl., TYPE, Ch) (tree 15 m.; leaves coriaceous, shining, flowers cream-yellow; fruit green; cupule crimson), *H. 523* (fl., Ch); Zarcero, Alfaro Ruiz, *A. Smith 10072* (fr., A). San José: El Tablazo de San José, *Valerio 34* (fr., Ch).

This species, with its fulvous-tomentose sulcate branchlets, has characteristics very like those of *P. Valeriana*. It also recalls the variable *P. helicterifolia*, but is easily separated by the much shorter inflorescences with a glaucous bloom.

18. *Phoebe obtusata* Lundell in Contr. Univ. Mich. Herb. 6: 21. 1941.

DISTRIBUTION: Known only from type-locality.

MEXICO: Chiapas: Buena Vista, near Escuintla, Jan. 1938, *Matuda 1887* (fl., TYPE, Mich).

This species is related to the *P. helicterifolia* complex but may be separated by the longer very full-flowered inflorescences, which are subterminal and branch profusely. The usually smaller leaves with obtuse or rounded apices and the shorter less harsh pubescence also serve to distinguish Lundell's species.

The stout branchlets are densely fulvous-tomentose. The leaves are alternate or subverticillate at the apex of the branchlets, the blades oblong-ovate to obovate-elliptic, up to 16 cm. long and about 6 cm. broad, rounded or obtuse at the base, occasionally subcordate, the apex obtuse or rounded. The petioles are stout, densely tomentose, up to 1.2 (–1.5) cm. long. The costa and nerves are impressed above and would be obscure were it not for the pubescence persisting on them after the upper surface of the leaf becomes glabrous or glabrescent. Beneath, they are conspicuously elevated and densely tomentose. The lateral nerves number to 9 or 10, the extreme upper pairs obscure, and diverge from the costa at an angle of about 45°. The axillary or subterminal inflorescence consists of a main terminal stalk or panicle (to 22 cm. long) with 1–3 shorter panicles (8–15 cm. long) branching from the base of the peduncle, which is short, stout and pubescent. The pubescence disappears toward the apex of the inflorescence. The entire inflorescence has a purplish cast extending to the perianth-tube. The flower is similar to that of *P. helicterifolia*. In fact, it is probable that more abundant collections will prove the two entities to be conspecific, with only geographical or ecological variation.

19. *Phoebe Valeriana* Standley in Field Mus. Publ. Bot. 18: 460. 1937.

DISTRIBUTION: Costa Rica, in forests at 1050–1800 m. altitude.

COSTA RICA: Alajuela: Region of Zarcero, upper tropical zone within Atlantic cloud-forest, *A. Smith H. 268* (fl., Ch, NY); La Peña, Alfaro Ruiz, Caribbean cloud-forest, *A. Smith P. 2120* (fl., A); woods of Los Angeles de San Ramón, near La Paz, *Brenes 4185* (197) (fl., Ch); Los Angeles and La Paz de San Ramón, *Brenes 6099* (fl., fr., Ch). San José: Forests of El Copey, Feb. 1898, *Tonduz 11746* (fl., TYPE, Ch, fr., US); Santa Maria de Dota, *Stork 2405* (fr., Ch).

NATIVE NAME: "Quizarrá" (Costa Rica).

The species has stout angled sulcate branchlets covered with a dense yellowish or brownish tomentum, eventually becoming more or less glabrescent. The petioles are canaliculate, thick, and equally tomentose, up to 2.5 cm. long. The subcoriaceous blades are obovate or occasionally oblong, 12–15 (–21) cm. long and 4–8 (–11) cm. broad, the base obtuse to cuneate, occasionally rounded, the apex rounded and sometimes emarginate to abruptly and shortly acuminate. The upper surface is scattered-pilose, the venation densely pubescent; the lower is more densely and softly tomentose. The costa and lateral nerves, of which there are 8 pairs diverging at an angle of about 45°, are slightly elevated above and prominently so beneath. The inflorescences are numerous tomentose axillary panicles up to 17 cm. long, the stout peduncles up to 8 cm. long, the subtending leaves frequently deciduous. The flowers are large, up to 5 mm. long and 8.5 mm. in diameter, the lobes spreading. The lobes are thin, elliptic, acute or obtuse, up to 4.25 mm. long. The stamens of the two outer series are ± 1.7 mm. long, the anthers almost sessile, ovate, apiculate. Those of the outer series are ± 2.15 mm. long, and the subrectangular anthers are only slightly longer than the stout filaments that bear two conspicuous subglobose subsessile glands. The staminodia are ± 0.8 mm. long, conspicuous, ovate or triangular, the stipes one-half the entire length. The glabrous gynaecium is ± 2.5 mm. long, the subglobose shortly stipitate ovary bearing a stout style and conspicuous capitate stigma of almost equal length. The fruit is subobovate-elliptic, obtusely apiculate, 3.3 cm. long and 1.5 cm. broad, including the stout stipe, which is about 6 mm. long and 7 mm. in diameter at the apex. The subtending cupule is hemispherical, about 12 mm. long, 13 mm. in diameter, and 6 mm. deep. The pedicel is short, not more than 3–4 mm. long, and about 6 mm. in diameter at the apex.

Standley relates the species to *P. betazensis*, a synonym of *P. helicterifolia*. It is also closely allied to the Mexican species *P. obtusata*, which has smaller leaf-blades and a more copiously flowered inflorescence branched from the base and glabrescent.

20. *Phoebe helicterifolia* (Meissner) Mez in Jahrb. Bot. Gart. Berlin 5: 193. 1889; Standley in Contr. U. S. Nat. Herb. 23: 294. 1922, in Trop. Woods 21: 17. 1930; Standley & Record in Field Mus. Publ. Bot. 12: 144. 1936; Yuncker in Field Mus. Publ. Bot. 9: 290. 1940.

Oreodaphne mexicana Meissner in DC. Prodr. 15¹: 118. 1864.

Oreodaphne mexicana var. α *subsessilis* Meissner, l.c.

Oreodaphne mexicana var. β *longipes* Meissner, l.c.

?*Oreodaphne mexicana* var. γ *diminuta* Meissner, l.c.

Oreodaphne helicterifolia Meissner in op. cit. 123.

Ocotea helicterifolia Hemsley, Biol. Centr. Am. Bot. 3: 73. 1882.

Ocotea mexicana Hemsley, l.c.

Ocotea mexicana var. α *subsessilis* Hemsley, l.c.

Ocotea mexicana var. β *longipes* Hemsley, l.c.

Ocotea mexicana var. γ *diminuta* Hemsley, l.c.

Phoebe betazensis Mez in op. cit. 192.

Phoebe nectandroides Mez in op. cit. 194.

DISTRIBUTION: Southern Mexico and Guatemala, in lowland forests at low altitudes of 250–450 m., and higher up in pastures or in pine-forests up to 1440 m.

MEXICO: Vera Cruz: Orizaba, *Botteri* 1018 (fl., type of *Oreodaphne mexicana* var. β *longipes* not seen, fragm., NY). Guerrero: Montes de Oca, Barranca, San Antonio-Buenos Aires, *Hinton* 14014 (fl., GH). Oaxaca: In Sierra San Pedro-Nolasco, Talea, *Galeotti* 7004 (fl., isosyntype of *Oreodaphne mexicana* var. α *subsessilis*, Ch), *Juergensen* 575 (fl., type of *Oreodaphne mexicana* var. γ *diminuta* not seen), 937 (fl., syntype of *Oreodaphne mexicana* var. α *subsessilis* not seen); in forest between Ozumazin and Río Chiquito, *Schultes & Reko* 726 (fr., GH). Chiapas: San Bartolo, alt. 150 m., Feb. 1840, *Linden* 1641 (fl., ISOTYPE of *Oreodaphne helicterifolia*, photo., GH, NY); along stony brooks or mountain-streams, Fenix, *Purpus* 10086 (fl., NY), 10356 (fl., GH). GUATEMALA: Alta Verapaz: Cobán, *H. Johnson* 578 (fr., Ch), *Standley* 69379 (fl., fr., Ch), 69525 (fl., A, Ch), 71446 (fl., A, Ch, NY), 91546 (fl., Ch), *von Tuerckheim* 2164, 8454 (fl., GH, NY); along Río Carchá, between Cobán and San Pedro Carchá, *Standley* 89985 (fl., Ch); between Cobán and Finca Chimoté, near Rubeltein, *Steyermark* 44207 (fl., Ch); lowland forest in valley, "pantano," $2\frac{1}{2}$ miles west of Cubilgüitz, *Steyermark* 44280 (fl., Ch); Cerro de Agua Tortuga (Sahacoc), vicinity of Cubilgüitz, *Steyermark* 44648 (fl., fr., Ch).

The present species is variable in practically every locality where it is known to occur. It varies in leaf-shape and size as well as in density of tomentum, but there can be no doubt that all of the specimens cited fall into the same species. The branchlets are densely or with age more sparsely clothed with a soft yellowish- or brownish-fulvous tomentum. The oblong, elliptic or obovate, obovate-elliptic or obovate-oblong usually membranaceous leaves are alternate or in whorls about the apex of the branchlets. The leaf-blades have one consistent characteristic: they are usually broadest through or above the middle. The blades are covered with a pubescence, the length of the hairs variable, becoming less with age, and more dense on the venation. The base is cordate to rounded, occasionally merely obtuse, and the apex is acuminate or abruptly acuminate, the acumen very short or up to 1.5 cm. long, obtusely or very sharply caudate. The blades are 9–15 (–25) cm. long and 2–9 (–12) cm. broad, and are subtended by a short stout densely tomentose peduncle at most up to 1 cm. long, frequently so short on the upper leaves as to make them appear sessile. The costa and lateral nerves, of which there are 8 or 9 (rarely –12) pairs, diverging at an angle of about 45° (the short lowermost almost at right angles), are impressed above but conspicuous because of the pubescence. They are elevated and densely pubescent beneath. The reticulation is obscure above and slightly more prominent beneath. The paniculate inflorescence is axillary and loosely few-flowered, usually up to 25 cm. long, with a purplish color conspicuous on the stem and flowers, the latter frequently exhibiting a purplish bloom on the entire surface. The inflorescence is scattered-pubescent toward the apex and borne on a long comparatively slender pubescent peduncle up to 13 cm. long. The flower is 5–6 mm. long, borne on a slender pedicel of about the same length or shorter. The strap-like or narrowly elliptic rather thick perianth-lobes are about 3 (–4) mm. long, spreading and reflexed at anthesis. The two outer series of stamens consist of elliptic or rotund-elliptic anthers, almost petaloid in some instances, \pm 1.5–2.5 mm. long, with very short filaments. Those of the inner series are more or less oblong, almost equalling the filaments, bearing

two sessile or slightly stipitate conspicuous sometimes spongy glands nearly the size of the anthers. The staminodia vary, stipe-like to ovate, up to ± 0.8 mm. long, the slender stipe one-half their entire length. The glabrous ovary is more or less globose, usually slightly longer than the rather thick style with its usually conspicuous subcapitate stigma, the entire gynaeceum measuring up to 3.2 mm. The infructescence has become thickened, occasionally longer, and often less pubescent. The fruits are black, glabrous, ellipsoid, apiculate, 2.4×1.7 cm., and are seated on a shallow cyathiform red cupule 3–4 mm. long, 7 mm. broad, and 2–3 mm. deep. The thickened pedicel is up to 9 mm. long expanded to about 4 mm. at its apex.

The nearest relationships are apparent in the species *P. amplexicaulis*, *P. mollis*, and *P. obtusata*, all from Mexico, for discussion of which see these species.

21. *Phoebe Salvini* (Mez) Lundell in Contr. Univ. Mich. Herb. 6: 23. 1941.

Ocotea Salvini Mez in Jahrb. Bot. Gart. Berlin 5: 264. 1889.

DISTRIBUTION: Guatemala and southern Mexico, up to 2800 m. altitude.

MEXICO: Chiapas: Rodeo, near Siltepec, in virgin forest, *Matuda 4578* (fr., A, NY). GUATEMALA: Without locality, *Aguilar 492* (fr., Ch). Quiché: In remnant of cloud-forest, Nebaj, *Skutch 1679* (fl., A, Ch). Chimaltenango: Volcán de Fuego, near Calderas, alt. 2590 m., 1873–4, *Salvin* (fl., TYPE of *Ocotea Salvini* not seen, fragm., Ch); region of Los Positos, above Las Calderas, *Standley 80191* (fl., fr., Ch). Sololá: Volcán San Pedro, north-facing slopes toward Lago de Atitlán, above village of San Pedro, in damp cloud-forest dripping with mosses and hepatics, *Steyermark 47215* (sterile, Ch).

From the leaf-fragment at Chicago, it is apparent that Standley's number 80191 is without question the species concerned. The minute ferruginous tomentum which clothes the young angled and striate branchlets and lower leaf-surface, petioles, and inflorescence is in striking contrast to the bright shining green glabrous or slightly scattered pubescent upper leaf-surface which is very conspicuously reticulate. The coriaceous leaf-blades are elliptic, auriculate at the base and acute to acuminate at the apex, 9–17 cm. long and 4–9.5 broad, subtended by stout canaliculate pubescent petioles up to 2 cm. long. The venation above is conspicuously yellow against the green surface of the blade, the costa and the 5–8 pairs of lateral nerves being slightly elevated. On the lower surface the venation is covered by the ferruginous tomentum, although it is conspicuously elevated. The robust ferruginous-tomentellous inflorescence, shorter than the leaves, is usually less than 8 but sometimes up to 10 cm. long, with its stout branches and peduncle (to 4.5 cm. long) conspicuously striate. The tomentellous flowers are 3–5 mm. long, subtended by pedicels of equal length. The elliptic lobes are fleshy and more or less papillose, up to 3 mm. long. The two outer series of stamens are ± 1.5 mm. long, with short stoutish filaments slightly pubescent at the base and one-half the length of the broadly oblong anthers. The stamens of the inner series are ± 1.7 mm. long, the somewhat squarish anthers equalling the filaments which bear at their bases two compressed sessile glands about one-third the length of the entire stamens. The glabrous gynaeceum, ± 2.5 mm. in length, consists of a subglobose or broadly ellipsoid ovary more than twice the length of the stout style, which is topped by a triangular rather inconspicuous stigma. The fruit is ellipsoid, 3×2.3 cm., seated on flattened disk-like cupule 3

mm. long, 14 mm. broad, and 1–2 mm. deep, which is very woody with a thickened almost double margin. The subtending pedicel is also enlarged to 1.5 cm. in length and 6 mm. in width at the apex.

22. *Phoebe amplifolia* Mez & J. D. Smith in Bot. Gaz. 19: 261, t. 24. 1894.

Persea amplifolia Mez in Standley & Calderón, Lista Prelim. Pl. Salvador 85. 1925.

DISTRIBUTION: Guatemala and from Costa Rica.

GUATEMALA: Quiché: El Jute, alt. 3050 m., April, 1892, *Heyde & Lux* 3033 (fl., ISOTYPE, GH, NY). El Progreso: Between Finca Piamonte and top of Montaña Piamonte, along Joya Pacayal, *Steyermark* 43641 (fl., Ch). COSTA RICA: San José: Near Rancho Redondo, near San José, *Popenoe* 984 (fl., Ch).

This species has very stout branchlets that are deeply sulcate and clothed with a fine close ferruginous tomentum. The canaliculate petioles are also sulcate, and are minutely tomentose and up to 3.2 cm. long. The coriaceous blades are elliptic, the base cuneate and recurved, the apex shortly and abruptly acuminate, 28–30 cm. long and 13–16 cm. broad. The upper surface is glabrous except for the persistent pubescence scattered along the venation and densely so on the costa and lateral nerves. The costa is slightly elevated above near the base and conspicuously so throughout on the lower surface. The lateral nerves, of which there are 8–12 conspicuous pairs diverging at an angle of 45–60°, are impressed above and prominently elevated beneath. The reticulation is obscure and impressed above and conspicuously elevated beneath. The inflorescence is axillary, densely tomentose, rather few-flowered, up to 13 cm. long, the stout peduncle up to 9 cm. The large flowers are nearly 5 cm. long and densely tomentose, with a short pedicel not more than 3 mm. long. The thick fleshy lobes are densely pubescent and papillose, and are \pm 3.8 mm. long. The stamens of the two outer series are \pm 1.7 mm. long, the almost quadrate rounded anthers about three times the length of the filaments. Those of the inner series are \pm 1.9 mm. long and the filaments bear two conspicuous sessile glands at the base. The staminodia are \pm 1.25 mm. long, ovate, the pubescent stipes almost one-half the entire length and often bearing near the apex two small roundish sessile glands. The glabrous gynaeceum is \pm 2.5 mm. long, the subglobose ovary slightly longer than the slender style, which bears a conspicuous triangular stigma. The ellipsoid fruit is 3 cm. long and 2 cm. broad and, according to the authors, is subtended by a thick subpateriform cupule that is obscurely double-margined and gradually narrows into the strongly enlarged pedicel.

The nearest relative of the species is *P. Salvini*, from which it is easily distinguished by the usually smaller leaves of the latter, which are covered on the lower surface with a finely appressed dense bright ferruginous tomentum, and the base of which is conspicuously auriculate rather than merely recurved.

23. *Phoebe padiformis* Standley & Steyermark in Field Mus. Publ. Bot. 23: 117. 1944.

DISTRIBUTION: Known only from the eastern part of Guatemala, at an altitude of 570 m.

GUATEMALA: Quezaltenango: Colomba, *Skutch* 1358 (fl., A, Ch, NY, US), alt. 570 m., Oct. 4, 1934, *Skutch* 1367 (fl., A, TYPE — Ch, NY, US) (tree 15 m. high and about 32 cm. diam.; crown full and rounded; bark smooth, brown; flowers greenish white).

This grayish species has striate fulvous-tomentose branchlets which are

quickly glabrous. The chartaceous leaf-blades are elliptic or oblong-elliptic or occasionally oblanceolate- and obovate-elliptic, more or less obtusely acuminate, and supported by pubescent or glabrescent sulcate petioles up to 12 mm. long. The blades are up to 13 cm. long and 5.5 cm. broad, greenish on the upper surface and brownish on the lower. A slight pubescence is apparent on both surfaces when very young, but it quickly disappears except for occasional remnants on the midrib above and beneath. The base is cuneate and the apex acute or acuminate to subcaudate-acuminate. The costa is impressed above and elevated beneath as are the 6 (-8) pairs of lateral nerves, which bear pubescent glands in their axils on the lower surface, and which diverge from the costa at an angle of about 45°. The loosely paniculate axillary and subterminal inflorescences are pubescent, becoming glabrous, shorter than the leaves (usually not longer than 8 cm.), and the branches are very narrow, giving a spicate appearance. In this respect the species resembles *P. mexicana*, but it differs in the smaller leaves which are penninerved rather than triplinerved, and in the more glabrous inflorescence. The flowers are about 3.4 mm. long and are borne on pedicels only slightly longer. The ovate acute thin perianth-lobes measure ± 2.5 mm. long. The two outer series of stamens are ± 1.5 mm. long, the filaments shorter than the oblong rounded anthers. The stamens of the inner series are ± 2.4 mm. long, the anthers more narrowly oblong and shorter than the thick filaments, which have two conspicuous stipitate reniform glands at their bases. The conspicuously ovate cordate staminodia are ± 1.25 mm. long, the thick pubescent stipes almost one-half the entire length. The glabrous gynaeceum is ± 2.4 mm. long, with the very slender style, topped by an inconspicuous discoid stigma, equalling the subglobose ellipsoid ovary.

24. *Phoebe psychotrioides* (H.B.K.) Mez in Jahrb. Bot. Gart. Berlin 5: 191, t. 3, fig. 43. 1889; Standley in Contr. U. S. Nat. Herb. 23: 293. 1922.

Ocotea psychotrioides H.B.K. Nov. Gen. & Sp. 2: 129 [162]. 1817.

DISTRIBUTION: Eastern Mexico, in Vera Cruz.

MEXICO: Vera Cruz: Near Jalapa, in moist valleys, alt. 1244 m., *Humboldt & Bonpland* 4434 (fl., TYPE of *Ocotea psychotrioides* not seen); near Vera Cruz, *Sumichrast* 940 (fr., NY); Orizaba, *Botteri* 1040 (fl., NY); Matlaluca, *Liebmann* (*Lauraceae* 69) (fl., GH); Mirador, *Liebmann* [14941] (fl., Ch); open damp forests, Zacuapán, *Purpus* 2959 (fl., Ch, GH, NY); forests near Tecomatla, *Purpus* 10460 (fr., NY); rocky slopes, Barranca de Tenampa, *Purpus* 16400 (fl., Ch).

This species may eventually be found to be a variation of *P. Pittieri* or of *P. Bourgeauviana*. Seemingly it differs from these in that its leaves are more elliptic than lanceolate and occasionally are obovate-elliptic. The flowers seem to be on the whole much smaller, although they show a tendency toward reflexed lobes typical of the two latter species. A study of the type may settle the question of relationship.

This very tall tree has terete glabrous branches and slender branchlets that are sulcate and pale subferruginous-pubescent. The slender petioles, also pubescent, are short, not more than 5 mm. long at most. The leaf-blades are lanceolate, the base cuneate and the apex shortly and abruptly subacuminate or subacute, 5 (-7) cm. long and 2 (-2.5) cm. broad, chartaceous or subcoriaceous, the upper surface smooth and shining, the lower pubescent to glabrous, the venation only slightly elevated above and prominently so beneath, everywhere more or less pubescent. The costa and lateral

nerves, of which there are 7 pairs diverging arcuately from the costa at an angle of 45° , are obscure above but rather prominent beneath. The reticulation is obscure above and somewhat prominent beneath. The inflorescences are narrowly or racemously paniculate, axillary or subterminal, not more than 6.5 cm. long, the slender peduncle up to 1.5 cm. long and glabrescent. The flowers are about 3 mm. long, supported by filamentous glabrescent pedicels not more than 2 mm. long. The tube is very short and the lobes elliptic, obtuse, pubescent, rather thin, and measuring ± 2.15 mm. long. The stamens of the two outer series are ± 1.25 mm. long, the ovate or almost quadrate anthers usually not much longer than the filaments, which are pubescent at the base. Those of the inner series are ± 1.7 mm. long, the rectangular anthers equalling the filaments that bear two subsessile globose glands at the base. The staminodia are usually up to ± 0.8 mm., occasionally longer, are ovate and borne on stipes equalling one-half their entire length. The glabrous gynaecium is ± 1.7 mm. long, the ovoid ovary about equalling the style, which bears a stigma which is subcapitate or flat but dilated, in any case conspicuous. The fruit of *Purpus 10460*, which seems to agree with the flowering material in foliage-characters, is ellipsoid-subglobose, minutely apiculate, up to 12 mm. long and nearly 10 mm. broad, subtended by a flat disk-like cupule (bearing remnants of the lobes of the perianth) about 1.5 mm. long and 8–9 mm. in diameter, the supporting pedicel slightly enlarged to sometimes nearly 15 mm. in length and expanded at the apex to 4 mm. in diameter.

25. *Phoebe chiapensis* Lundell in Contr. Univ. Mich. Herb. 6: 21. 1941.

DISTRIBUTION: Known only from the type-locality.

MEXICO: Chiapas: Mt. Ovando, Dec. 1937, *Matuda 2064* (fl., ISOTYPE, A, NY) (tree 7–8 m. high, 20 cm. diam.).

This species is striking with its slender reddish branchlets, petioles, and inflorescences, that are sparsely glabrescent. The midvein of the almost linear-lanceolate acuminate glabrous leaves is also reddish in contrast to the green color of the blade. The costa is prominent beneath, whereas the delicate lateral nerves, of which there are 5–7 pairs, are fairly obscure throughout. The reticulation is apparent on both surfaces. The leaves measure up to 10 cm. long and 2 cm. broad and the slender petioles are slightly more than 1 cm. long. The axillary few-flowered inflorescence is up to 5 cm. long and glabrous. It bears flowers which have ovate acute perianth-lobes and are borne on pedicels that are sometimes 8 mm. long. The stamens of the two outer series are ± 1.25 mm. long, the pubescent filaments somewhat shorter than the oblong obtuse anthers. Those of the inner series are ± 1.7 mm. long and bear two subsessile glands at the base of the filaments. The staminodia are subovate, ± 1.15 mm. long, with very short pubescent stipes. The glabrous gynaecium consists of a subglobose ovary, slightly longer than the tapering style, and a conspicuous capitate stigma. The fruit is unknown.

Lundell has related this species to *P. pallescens* and *P. salicifolia*. The former has leaves that are lanceolate or elliptic, with the lateral nerves numbering upwards of ten. The inflorescence of *P. pallescens* is twice as long as that of *P. chiapensis*. The latter species may be easily separated from *P. salicifolia* by its penninerved leaves which show no trace of a tendency to a triplinerved condition. The convex reticulation of the leaf-blades of

P. salicifolia is not to be found in the leaves of *P. chiapensis*. Floral characters also separate the latter from the two above-mentioned species. Just where one would place the species is a question that may not be solved until more and better material is available. The type-specimen is injured by galls, which in many cases are apt to distort the structure typical of a given species.

26. *Phoebe tampicensis* (Meissner) Mez in Jahrb. Bot. Gart. Berlin 5: 200. 1889; Standley in Contr. U. S. Nat. Herb. 23: 294. 1922.

Oreodaphne tampicensis Meissner in DC. Prodr. 15: 136. 1864.

Ocotea tampicensis Hemsley, Biol. Centr. Am. Bot. 3: 74. 1882.

Phoebe angustata Blake in Contr. Gray Herb. n.s. 52: 63. 1917. (sphalm., in Ind. Kew. *Ocotea*).

DISTRIBUTION: Mexico, chiefly in Tamaulipas and San Luis Potosí, from 300–500 m. altitude.

MEXICO: Tamaulipas: Near Tampico, *Berlandier* 132 (fl., fragm. of TYPE of *Oreodaphne tampicensis*, NY); vicinity of Victoria, alt. 320 m., Feb. 1–April 9, 1907, *E. Palmer* 80 (fl., type of *P. angustata*, GH, isotype, NY); Sierra near Victoria, Jaumave, *von Rozynski* 719 (fl., Ch, NY), 750 (fl., Ch); Cuesta del Abra, *LeSueur* 147 (fr., Ch). San Luis Potosí: Valles, San Luis Potosí, *Kenoyer* A. 606 (fr., Ch); limestone hills, Las Palmas, *Pringle* 3794 (fr., GH). Oaxaca: Choapam, coffee plantation to north, Yaveo, *Mexia* 9140 (fl., GH, NY).

Phoebe tampicensis, like the preceding species, has attenuately linear-lanceolate leaf-blades cuneate at the base and acuminate at the apex, which are chartaceous to subcoriaceous and measure up to 13.5 cm. long and up to 2.3 cm. broad. They are early pubescent but soon glabrous throughout except for occasional pubescent glands in the axils of the lateral nerves. They are subtended by a minutely pubescent soon glabrous slender petiole which may be light yellowish and may measure up to 1.3 cm. long. The midrib is visible above but conspicuously elevated beneath, whereas the lateral nerves and reticulation are everywhere obscure. The lateral nerves number 12–16 pairs, diverging at an angle of about 40°. The inflorescence consists of axillary loose many-flowered slightly pubescent panicles not more than 3 (–7) cm. long, with a peduncle not more than 2 cm. long. The flowers are broadly campanulate, about 3 mm. long, equaling the slender slightly pubescent pedicels. The perianth-lobes are elliptic, rather thick, and \pm 2.5 mm. long. The two outer series of stamens are \pm 1.25 mm. long, the subquadrangular anthers twice the length of the rather thick filaments. The stamens of the third or inner series are \pm 1.5 mm. long, bearing conspicuous stipitate glands which, as well as the filaments, equal the quadrangular emarginate anthers. The glabrous gynaeceum measures \pm 1.9 mm. long, the ellipsoid ovary nearly twice the length of the rather thick style, which is topped by a slightly enlarged subcapitate stigma. The fruit is broadly ellipsoid, apiculate, olive-greenish, glabrous, up to 1.8 cm. long and 1.3 cm. broad, very smooth on drying, seated on a flat disk-like cupule about 1 mm. long and 5 mm. in diam., which is subtended by the enlarged pedicel to about 6 mm. in length and 3 mm. in diameter at the apex.

The species is most closely related to *P. acuminatissima* Lundell, from which it differs in its linear-lanceolate leaves with more numerous and more obscure lateral nerves and larger fruit. The floral structure of the two species is very dissimilar.

27. *Phoebe pallescens* Mez in Jahrb. Bot. Gart. Berlin 5: 218. 1889; Standley in Contr. U. S. Nat. Herb. 23: 293. 1922.

DISTRIBUTION: Known only from the type-locality, in Mexico.

MEXICO: Vera Cruz: Near Orizaba, in 1855, *F. Mueller* 90 (fl., fr., ISOTYPE, NY).

This species stands out because of the glabrous character of its slender reddish striate branchlets and its glabrous lanceolate or elliptic leaves, which are glaucous beneath. The leaf-blades are chartaceous, greenish brown above, the base obtuse to cuneate, often oblique, the apex subacute to acuminate, with a slender canaliculate petiole up to 17 mm. long, and measure up to 10 cm. long and 3.3 cm. broad. The midrib is reddish yellow, impressed above and elevated beneath. The lateral nerves are indistinct above and only delicately elevated beneath, numbering up to 11 pairs. The reticulation is everywhere apparent. The glabrous loose subpyramidal panicle few-flowered slender inflorescences are up to 10 cm. long, equaling or slightly longer than the leaves, the peduncle being as long as 8 cm. The subcampanulate flowers are up to 2.15 mm. long, and outstanding because of the long slender pedicels reaching a length of 8 mm. The ovate lobes are very thin, measuring ± 1.9 mm. long. The stamens of the two outer series are ± 1 mm. long and the ellipsoid apiculate anthers are twice the length of the filaments. The stamens of the inner series are ± 2.15 mm. long, with the oblong-ovate anthers equalling the stout filaments, which bear two conspicuous reniform shortly stipitate glands at the base, not quite equalling the filaments in length. The glabrous gynaeceum measures ± 1.5 mm., the subglobose ovary longer than the slender style, which bears a discoid subtriangular stigma at its apex, according to Meissner. He notes that the fruit is abnormally large, seated on the greatly enlarged cylindrical pedicel with the lobes deciduous. I have not seen a fruiting specimen.

The affinity seems to be with *P. acuminatissima* and with *P. mollicella*, from the first of which species it is separable by the glabrous leaves and from the second by the larger number of lateral nerves.

28. *Phoebe acuminatissima* Lundell in Contr. Univ. Mich. Herb. 6: 19. 1941.

Phoebe saxchanalensis Lundell in op. cit. 7: 14. 1942.

DISTRIBUTION: In the mountains of Chiapas, Mexico, at 2700 m., and Guatemala at 250–2000 m. altitude.

MEXICO: Chiapas: Mt. Ovando, Dec. 1937, *Matuda* 2107 (fl., ISOTYPE of *P. acuminatissima*, A, NY) (tree 5 m., 15 cm. diam.); Sierra Madre, Saxchanal, in virgin forest, *Matuda* 4311 (fr., isotype of *P. saxchanalensis*, A, NY) (small tree 5 m. high).

GUATEMALA: Quezaltenango: Lower south-facing slopes of Volcán Santa María, between Finca Pirineos and Los Positos, between Santa María de Jesús and Calahuaché, *Steyermark* 33750, 33752 (fr., Ch); slopes and ridges between Quebrada Chicharro and Montaña Chicharro, on southeast-facing slopes of Volcán Santa María, *Steyermark* 34356 (fr., Ch). Sacatepéquez: Wooded slope above Dueñas, *Standley* 63141 (fl., Ch). Suchitepéquez: At edge of ravine, Finca Moca, *Skutch* 2099 (fl., A). Santa Rosa: With pine on upper slopes near the sulfur deposits, Volcán Tecumburro, along trail to San Francisco Tecumburro on summit of volcano, north of Chiquimulilla *Steyermark* 33156 (fl., Ch).

The small tree of 5 m. described from Chiapas by Lundell in Guatemala reaches a height of 20 m. The very slender branchlets are early covered with a fine grayish- or fulvous-sericeous pubescence which becomes darker and less conspicuous with age. The young leaves also bear the same type of pubescence, which disappears entirely from the upper surface at maturity

but persists on the lower. The membranaceous lanceolate long-acuminate leaf-blades (up to 12.5×3 cm.) are supported by slender pubescent petioles 10–17 mm. long. The base is cuneate and often unequal. The costa is impressed above and conspicuously elevated beneath, whereas the slender lateral nerves are scarcely visible above and hardly more so beneath. There are upwards of 19 obscurely visible pairs of lateral nerves diverging from the costa at an angle of $45-55-70^\circ$. Frequently the pubescent glands present at their junction are made conspicuous by the infiltration of extraneous matter. The few-flowered axillary minutely pubescent panicles, shorter than the leaves (4–5 [7] cm.), arise on almost filiform peduncles up to 3.5 cm. long. The thick fleshy heavily papillose-tomentose perianthlobes are ± 2.5 mm. long, oblong and reflexed at anthesis. The stamens of the two outer series are ± 1.25 mm. long, the ovate obtuse anthers somewhat longer than the slender filaments. Those of the inner series are about 1.5 mm. long, the subquadrate anthers equalling the filaments bearing at the base two subsessile subglobose glands. The ovate staminodia are $\pm 0.4-0.8$ mm. long, borne on slightly longer pubescent stipes. The subglobose glabrous ovary is slightly longer than the style, which is topped by a conspicuous peltate stigma. The glabrous fruits are ellipsoid-obovoid, up to 12 mm. long and 7 mm. broad, subtended by a cupule which is about 2 mm. long, 5 mm. in diameter, and about 1 mm. in depth. Lundell gives larger measurements, so presumably the sheet at Michigan has fruit in a more advanced stage. The pedicel is enlarged and about 5 mm. long, the apex expanded to about 3 mm. in diameter.

The nearest relative is *P. mollicella*, from Costa Rica, which may be at once distinguished by its smaller leaves with fewer pairs of lateral nerves and shorter petioles. The pubescence of the latter species is consistently more yellowish than gray, a feature which alone would not carry much weight. Also the flowers are greater in number, and their structure differs materially.

29. *Phoebe mollicella* Blake in Contr. Gray Herb. n.s. 52: 64. 1917; Standley in Field Mus. Publ. Bot. 18: 459. 1937.

DISTRIBUTION: Known only from the forests of Costa Rica, up to an altitude of 2135 m.

COSTA RICA: Alajuela: Zarcero, Alfaro Ruiz, in clay-loam, in half-shade on hill-slope of open forest of upper tropical zone, *A. Smith P. 2309* (fl., A), edge of woodland, *A. Smith P. 2392* (fl., A); Guadalupe de Alfaro Ruiz, *A. Smith 4178* (fr., Ch); Zarcero, *A. Smith 10068* (fl., fr., A). San José: Vicinity of Santa María de Dota, *Standley 42421, 42426* (fl., Ch); forests of El Copey, alt. 1800 m., Feb. 1898, *Tondus 7353* (Herb. Nat. Costa Rica 11676) (fl., Ch, TYPE — GH, NY). Cartago: South-eastern slope of Irazu, *Stork 3177* (fr., Ch).

NATIVE NAMES: "Quizarrá," "Quizarrá amarillo," "Madera buena" (Costa Rica).

The species is distinguished at once by the soft pale ferruginous tomentum which clothes the young branchlets and leaves and the lower surface of the mature leaf-blades. The branchlets are conspicuously striate and slender. The leaf-blades are chartaceous, smooth and shining above, elliptic, occasionally lanceolate-elliptic, cuneate at the base and acuminate to obtuse at the apex, measuring 5–8.5 cm. in length and 1.3–2.3 cm. in width. The lateral nerves, of which there are usually 6 pairs, diverge at an angle of about $35-45^\circ$. The venation above is pubescent and conspicuous though scarcely elevated. Beneath it is elevated and heavily tomentose. The

short few-flowered tomentose inflorescences, not more than 5 cm. long, are borne on peduncles up to 2.5 cm. The lobes of the perianth are spreading and reflexed, about 2.5 (-3) mm. long, rather heavy in texture, elliptic and obtuse. The two outer series of stamens are about 1.3-2 mm. long, the ovate obtuse anthers slightly longer than the filaments. The stamens of the inner series measure about 1.5 mm. long, the oblong anthers equalling the slender filaments, which bear at the base two sessile glands about one-third the length of the entire stamen. The glabrous gynaeceum is \pm 2.8 mm. long, the ellipsoid ovary with a style one-third its length topped by a more or less triangular conspicuous stigma. The fruit is oblong-ellipsoid, glabrous, 2 cm. long and 1.3 cm. broad, black, with primrose yellow base or "eye" (according to the collector Stork), the campanulate cupule green or reddish to scarlet, about 2 mm. long, 6 mm. broad at the flaring undulate apex, and 1 mm. deep, with the pedicel about 5 mm. long enlarged at the tip to 3 mm. in diameter.

The nearest species is *P. acuminatissima*, from Mexico and Guatemala. The relationship has been discussed under that species.

30. *Phoebe Bourgeauviana* Mez in Jahrb. Bot. Gart. Berlin 5: 194. 1889; Standley in Contr. U. S. Nat. Herb. 23: 294. 1922.

Phoebe purpurea Mez in Jahrb. Bot. Gart. Berlin 5: 196. 1889.

DISTRIBUTION: Southern Mexico through Guatemala, at an altitude of 1300-3000 m., to Honduras at a lower altitude of 1050 m.

MEXICO: Vera Cruz: Vallée de Cordoba, April 9, 1866, *Bourgeau* 2234 (fl., fr., ISOTYPE of *P. Bourgeauviana*, Ch, GH). GUATEMALA: Quiché: San Miguel Uspantán, *Heyde & Lux* 3089 (fl., GH). Huehuetenango: Jacaltenango, mountain-slopes, *C. & E. Seler* 2598 (fl., GH). Alta Verapaz: Mountains east of Tactic, on road to Tamahú, *Standley* 71282 (fl., Ch); large swamp east of Tactic, in forest, *Standley* 92314 (fl., Ch), *Steyermark* 43966 (fl., Ch); in mountain-forests near Laraxquia, *von Tuerckheim* 371 (fl., photo. of type of *P. purpurea*, Ch, GH); Cobán, *von Tuerckheim* 1651 (fl., GH). Baja Verapaz: Mountain-side north of divide north of Santa Rosa, *Standley* 69883 (fl., Ch). San Marcos: Río Vega, near San Rafael and Guatemala-Mexico boundary, Volcán Tacaná, *Steyermark* 36267 (fl., Ch). El Progreso: Between Calera and middle slopes of quebradas of Volcán Siglo, *Steyermark* 43020 (fr., Ch). Zacapa: Upper reaches of Río Sitio Nuevo, *Steyermark* 43237 (fr., Ch). Chiquimula: Middle slopes of Montaña Norte to El Jutal, on Cerro Brujo, south-east of Concepción de las Minas, *Steyermark* 31072 (fr., Ch); Volcán Quezaltepeque, 3-4 miles northeast of Quezaltepeque, *Steyermark* 31442 (fr., Ch). HONDURAS: Comayagua: Vicinity of Siguatepeque, *Standley* 56055 (fl., Ch); on river-banks, plains, *Yuncker, Dawson & Youse* 5777 (fr., Ch, GH).

This species is a variable one, the branchlets clothed with a ferruginous tomentum often with a purplish cast, of varying length, density, and shade. The chartaceous leaves are lanceolate to lanceolate-elliptic, acuminate to subcaudate-acuminate, glabrous to glabrescent and somewhat shining above, except for the pubescent costa, and softly tomentose beneath. The blades measure 7-10 (-12) cm. long and 2-3.5 (-5) cm. broad, and are subtended by pubescent petioles up to 11 mm. long. The costa and lateral nerves, which number no more than 7 pairs diverging at an angle of 45-35° from the costa, usually are visible above but very prominently elevated beneath. The loose reticulation is obscure above and apparent beneath. Pubescent glands are borne beneath in the axils of the lateral nerves. The pubescent to glabrescent few-flowered inflorescences are much shorter than the leaves, measuring not more than 7 cm. in length, the slender peduncle

not more than 5 cm. long. The flowers are purplish on drying, about 4–5 mm. long, borne on pedicels of almost the same length. The spreading or at times reflexed lobes of the perianth are elliptic, obtuse, pubescent, up to 3 mm. long. The two outer series of stamens vary from ± 1.25 –2.7 mm. long, with anthers that are petaloid, subrhomboid to ovate, obtuse, subsessile or with short filaments. The stamens of the inner series are ± 1.25 mm. long, with oblong anthers equalling the filaments and only slightly exceeding the conspicuous sessile glands at the base. The staminodia vary from triquetrous to cordate, ± 0.8 –1.25 mm. long, the stipes equalling one-half the entire length. The glabrous gynaeceum varies in size up to ± 2.15 mm. long, the ovoid or elliptic ovary being more than twice the length of the stout short style, which is topped by an often somewhat decurrent triangular conspicuous stigma. The fruits are ellipsoid-subobovate, apiculate, up to 2 cm. long and 1 cm. broad, green turning purple-black, seated on a cupule which is rose-red at maturity. The glabrous cupule is cyathiform, about 4 mm. long, 7 mm. broad at the flaring slightly undulate apex, and 1.5 mm. deep. The enlarged pedicel is up to 1 cm. long and 4 mm. broad at the apex.

The nearest relative of the species is *P. Pittieri* from Costa Rica and northwestern Panama. The latter differs from *P. Bourgeauviana* in the rough quality of the pubescence on the leaves, which are never more than 9 cm. long, usually around 7 cm., and 2.5–3 cm. broad. The reticulation of the leaves is far more prominent and the lateral nerves never more than 5 pairs. The flowers are similar to those of *P. Bourgeauviana*. The fruits are smaller and frequently borne on a longer pedicel.

31. *Phoebe Pittieri* Mez in Bot. Jahrb. 30: Beibl. 67: 16. 1901; Standley in Field Mus. Publ. Bot. 18: 460. 1937; Lundell in Contr. Univ. Mich. Herb. 6: 22. 1941.

DISTRIBUTION: Woods of Costa Rica and Panama, at an altitude of 1050–2200 m.

COSTA RICA: Alajuela: Woods, La Palma de San Ramón, *Brenes 5334* (483) (fr., Ch), *5405* (549) (sterile, Ch), *5416* (fl., Ch); moist woods on the hills of Santiago near San Ramón, *Brenes 14464* (sterile, GH); Palmira, Alfaro Ruiz, in sub-tropical zone, in wet loam at edge of swamp, in semi-shade, *A. Smith H.522*, *H. 679* (fl., Ch). San José: Forests of El Copey, *Tonduz 11893* (fl., photo. of TYPE, GH). PANAMA: Chiriquí: Cloud- and rain-forest of Cerro Horqueta, *C. & V. W. von Hagen 2031*, *2070* (fl., fr., A, Mo), *2022* (fl., A, Mo).

The branchlets of this species are fulvous- or yellowish-tomentose, the very young ones somewhat sericeous, becoming fuscous with age, and harsh to the touch. The leaf-blades rarely exceed 7 cm., occasionally 9, in length and 2.5–3 cm. in breadth: they are lanceolate or elliptic with cuneate base, acuminate to obtusely acute apex, and a canaliculate pubescent petiole up to 10 mm. long. The upper surface is smooth and almost shining, the lower roughly pubescent. The lateral nerves, diverging from the costa at a 35–45° angle, usually number 5 pairs and are inconspicuous above but elevated beneath, frequently with inconspicuous axillary glands. The loose reticulations are slightly more prominent beneath than above. The few-flowered pubescent to glabrescent axillary inflorescence is not more than 5.5 cm. long, the peduncle not more than 2 cm. The white (purplish in dried state) flowers are somewhat like those of *P. Bourgeauviana*, being spreading-campanulate, up to 5 mm. long, with slender pedicels to 8 mm. The elliptic lobes are thick, papillose, up to 3 mm. long and often reflexed in

anthesis. The two outer series of stamens measure ± 1.7 mm. long, the roundish anthers equalling the filaments. The stamens of the inner series have oblong anthers equalling the filaments and the large sessile spongy glands at the base of the latter. The staminodia are ± 1 mm. long, ovate, subcordate, the stipes slightly more than one-half the entire length. The glabrous gynaecium is ± 2.8 mm. long and has an obovoid or subglobose ovary slightly narrowed at the base and one-third longer than the style, which bears an inconspicuous discoid stigma. The fruits are greenish to purple, ellipsoid, glabrous, 12×9 cm., and seated in a flaring undulate fluted cyathiform reddish cupule about 5 mm. long, 9 mm. diam., and 3 mm. deep. The enlarged pedicel is upwards of 1 cm. long and expanded to 4 mm. at the apex.

The nearest relative of the species is *P. Bourgeauviana*, under which species is a discussion concerning the two entities.

DOUBTFUL SPECIES AND VARIETIES OF PHOEBE

Phoebe effusa β *areolata* Meissner in DC. Prodr. 15¹: 33. 1864.

Mez cites *Linden 19*, the type, from Jalapa, Mexico, under *Nectandra sanguinea*. The type is not available at this time.

Phoebe granatensis β ? *Oerstedii* Meissner in DC. Prodr. 15¹: 32. 1864.

Mez cites the type of this, from Volcán Barba, Costa Rica, *Oersted 4*, under *Phoebe mexicana* Meissner. I have not seen the type.

Phoebe mayana Lundell in Amer. Midl. Nat. 29: 473. 1943.

I have not been able thus far to match this fruiting specimen with any material at hand. It is somewhat doubtful whether or not this is the correct genus. The generic lines of fruiting characters are not yet as clear-cut as it is to be hoped that future study may render them. For this reason, it is difficult to determine the genus of a specimen on fruiting characters alone. At present, since I cannot relate the species to any known entity, I am not including it in the general treatment or the key. Possibly it may belong to *Beilschmiedia*.

SPECIES EXCLUDED FROM PHOEBE

Phoebe Benthamiana Mez = *PERSEA PACHYPODA* Nees.

Phoebe Hartwegii Meissner = *PERSEA PACHYPODA* Nees.

Phoebe insularis Meissner = *OCOTEA INSULARIS* (Meissner) Mez.

Phoebe pachypoda Mez = *PERSEA PACHYPODA* Nees.

3. Ocotea Aublet

Ocotea Aublet, Pl. Guian. 2: 780, t. 310. 1775; Hemsley, Biol. Centr. Am. Bot. 3: 72. 1882; Mez in Jahrb. Bot. Gart. Berlin 5: 219. 1889.

Oreodaphne Nees, Pl. Laurin. [Progr.] 15. 1833, in Linnaea 8: 39. 1833, Syst. Laurin. 380. 1836; Meissner in DC. Prodr. 15¹: 111. 1864.

Dendrodaphne Beurling in Vet. Akad. Handl. Stockholm 1854: 145. 1856.

Sassafridium Meissner in DC. Prodr. 15¹: 171. 1864.

DISTRIBUTION: Throughout the American tropics from Mexico through Central America, with the greatest number of species occurring in South America.

Trees or shrubs usually with alternate leaves varying from membranaceous to rigidly coriaceous, the blades from 9 cm. to 55 cm. long, and

equally as variable in shape and pubescence. The reticulation of the leaf-blades of this genus is an important diagnostic character. Occasionally the decurrence and recurving of the leaf-bases into the broad petioles is manifest. The inflorescences are usually paniculate, and bear usually in this area flowers that are perfect. There are three species, as far as can be ascertained from the material at hand, that have dioecious flowers. In the perfect flowers the perianth-tube may be conspicuous or almost entirely absent. The lobes may be fleshy or thin in texture, and are, for the most part, equal or at most subequal, usually deciduous, although they may persist in some species as remnants crowning the expanded perianth-tube in fruit. Generally speaking, the stamens, of the two outer series bear variously shaped anthers that are sessile or borne on glabrous or pubescent filaments of varying length. The anthers may be petaloid and papillose, exhibiting a substantial connective, or they may have no perceptible connective tissue present. Usually the four introrse cells are arranged in two planes, one above the other. Those of the inner series have longer filaments accordingly, which always bear two sessile or stipitate glands which vary in size and shape, often so large that they appear confluent. The four cells of the anthers are sometimes all extrorse; sometimes the two upper are lateral or lateral-extrorse, the two lower being wholly extrorse or rarely lateral-extrorse. If staminodia are present they are usually stipitate, linear-lanceolate, or very occasionally ovate, pubescent or glabrous but invariably thin in texture. The gynaecium is usually glabrous, the style rarely being slightly pubescent, and of varying length. The stigma may be small, inconspicuous, and discoid, or large, conspicuous, peltate or triangular, and slightly decurrent at the angles. In species with dioecious flowers, the ♀ flower shows staminodia replacing the first three series of stamens found in the perfect flowers. The staminodia may have well developed anthers, but usually they are smaller, not much broader than the filaments and with the cells evident though often malformed. The gynaecium develops as in the perfect flowers. The ♂ flowers have well developed stamens, but either lack the gynaecium entirely or have an aborted small linear structure, the different parts being indeterminate; or the ovary is as slender as the style, but topped by an extremely large stigma. The fruit is ellipsoid or globose, borne in a usually simple-margined cupule, although in a very few species the margin is inconspicuously double. The cupule may be flat and disk-like, the margin undulating, or hemispherical and plane, or variously 6-lobed, the lobes being the remnants of the persistent perianth-lobes.

KEY TO THE SPECIES OF OCOTEA

- A. Largest leaf-blades not less than 20 cm. long.
- B. Leaf-blades heavily coriaceous and densely and conspicuously reticulate and shining above.
- C. Leaf-blades pubescent beneath.
- D. Leaf-blades decurrent at the base, strongly recurved and closely appressed-pubescent; petioles not canaliculate. 1. *O. stenoneura*.
- D. Leaf-blades not decurrent at the base nor recurved, but pubescent; petioles shallowly canaliculate. 2. *O. Cooperi*.

- C. Leaf-blades glabrous beneath and heavily coriaceous.....3. *O. Seibertii*.
- B. Leaf-blades, if densely reticulate, not conspicuously so and not shining above; texture various.
 - C. Leaf-blades beneath conspicuously ferruginous- or subferruginous-tomentose; venation conspicuously pubescent; inflorescence densely ferruginous- or subferruginous-tomentose.
 - D. Leaf-blades coriaceous; reticulation usually obscured beneath by a fine tomentum; branchlets stout; lateral nerves 8 or 9 pairs...4. *O. palmata*.
 - D. Leaf-blades membranaceous, with long subferruginous pubescence on venation beneath; reticulation conspicuous; branchlets slender; lateral nerves 7-10 pairs.....5. *O. mollifolia*.
 - C. Leaf-blades glabrous or glabrescent beneath, not conspicuously ferruginous- or subferruginous- or brownish-tomentose.
 - D. Leaf-blades definitely obovate.
 - E. Base of leaf-blades decurrent, sometimes very conspicuously so and recurved.....6. *O. Ira*.
 - E. Base of leaf-blades never conspicuously decurrent or recurved.
 - F. Leaf-blades not more than 9 cm. broad.
 - G. Axillary glands absent or so minute and inconspicuous as to be unobserved.
 - H. Branchlets glabrous; cupule of thin texture, brittle about the margin; fruit globose, 1 cm. diam....7. *O. Wedeliana*.
 - H. Branchlets brownish-pubescent; cupule woody; fruit ellipsoid, 2.5 cm. diam.....8. *O. subalata*.
 - G. Axillary glands conspicuous.
 - H. Cupule very shallow, lobed, 7 mm. diam.; fruit oblong-ellipsoid, to 2 cm. long; branchlets frequently dark brownish-pubescent; style twice the length of ovary; leaves not shining beneath.....9. *O. eucuneata*.
 - H. Cupule thick, woody, entire, 1.5 cm. diam.; fruit ellipsoid, at least 2.5 cm. long; branchlets glabrous; style shorter than ovary; leaves shining beneath....10. *O. verapazensis*.
 - F. Leaf-blades not less than 10 cm. broad (usually 15-20 cm.).
 - G. Branchlets sturdy, heavily angled; blades shortly obtusely acuminate.....11. *O. nicaraguensis*.
 - G. Branchlets terete, only young slightly angled; apex of the blades rounded or very obtuse or rarely acute or shortly abruptly subacuminate.....12. *O. Standleyi*.
 - D. Leaf-blades elliptic or oblong or oblong-elliptic or oblanceolate.
 - E. Leaf-blades not less than 12 cm. broad.....12. *O. Standleyi*.
 - E. Leaf-blades not more than 10 cm. broad.
 - F. Leaf-blades membranaceous.....13. *O. atirrensis*.
 - F. Leaf-blades not membranaceous.
 - G. Leaf-blades coriaceous, brownish or castaneous...14. *O. Paulii*.
 - G. Leaf-blades chartaceous, greenish.
 - H. Leaf-blades smooth on upper surface, pale.....15. *O. Dendrodaphne*.
 - H. Leaf-blades with conspicuous reticulation throughout, not pale green above.....10. *O. verapazensis*.
- A. Largest leaf-blades not more than 17 cm. long (rarely 20, in *O. eucuneata*).
- B. Leaf-blades variable, usually not obovate but elliptic or lanceolate-elliptic or variations of these shapes, acute or rounded, always chartaceous; margin always finely undulate, appearing crisped on drying; petioles usually blackish; bark grayish.....16. *O. veraguensis*.
- B. Leaf-blades obovate; margin not consistently finely undulate.
 - C. Leaf-blades with bases decurrent or recurved.

- D. Leaf-blades membranaceous and with 3-6 pairs of conspicuous ellipsoid densely grayish-pubescent axillary glands.....17. *O. chiapensis*.
- D. Leaf-blades not membranaceous; glands, if present, few pairs and very inconspicuous.
 - E. Reticulation everywhere prominent; leaves shining above, appressed-sericeous, becoming glaucescent and glabrescent beneath.....18. *O. Austinii*.
 - E. Reticulation not prominent; leaves not shining above nor ferruginous-pubescent beneath.
 - F. Leaves sessile, the blades broadly decurrent and recurved; cupule entire, pubescent; axillary glands not narrowly ellipsoid; apparent petiole 2-3 cm. long.....19. *O. Endresiana*.
 - F. Leaves shortly petiolate, the blades narrowly decurrent and recurved; pubescent axillary glands not narrowly ellipsoid; cupule 6-lobed; apparent petiole not more than 1.5 cm. (rarely 2.5 cm.).20. *O. Tonduzii*.
 - F. Leaves shortly petiolate, the blades narrowly decurrent and recurved; cupule entire; pubescent axillary glands when present conspicuously narrowly ellipsoid; apparent petiole to 2.5 cm. long.....21. *O. Skutchii*.
- C. Leaf-blades with bases not decurrent or recurved.
 - D. Largest leaf-blades not less than 15 cm. long.....8. *O. subalata*.
 - D. Largest leaf-blades not more than 12 cm. long (except *O. eucuneata*).
 - E. Leaf-blades coriaceous; reticulation minute but conspicuous; nervation very prominently elevated beneath and reddish yellow.....22. *O. rubrinervis*.
 - E. Leaf-blades not coriaceous; reticulation not conspicuous; nervation elevated but not strikingly conspicuous beneath.
 - F. Lateral nerves up to 7 pairs; branchlets pale buff-gray; cupule thick, woody, the margin undulate, 13 mm. diam.; flowers dioecious (?).....23. *O. subsericea*.
 - F. Lateral nerves 7-12 pairs; branchlets fuscous; cupule shallow, cyathiform, lobed, of thinnish texture; flowers monoecious.....9. *O. eucuneata*.
- B. Leaf-blades not obovate.
 - C. Leaf-blades not more than 2.5 cm. broad.
 - D. Reticulation and lateral nerves prominent throughout; apex of blades acuminate24. *O. Klotzschiana*.
 - D. Reticulation and lateral nerves very obscure; apex caudate-acuminate... ..25. *O. effusa*.
 - C. Leaf-blades not less than 3.5 cm. broad (usually broader).
 - D. Leaf-blades definitely oblong and rigidly coriaceous; inflorescence up to 16 cm. or more long.
 - E. Leaf-blades not more than 11 cm. long, densely ferruginous-sericeous beneath; inflorescence to 25 cm. long.....18. *O. Austinii*.
 - E. Leaf-blades not less than 12 cm. long, glabrous throughout; inflorescence up to 16 cm. long.....14. *O. Paulii*.
 - D. Leaf-blades not oblong, or, if oblong, definitely not rigidly coriaceous; inflorescence usually not more than 12-13 cm. long.
 - E. Leaf-blades oblong or oblong-elliptic, membranaceous or chartaceous or subcoriaceous; apex always caudate-acuminate or abruptly obtusely acuminate.
 - F. Flowers perfect; inflorescence few- to many-flowered.....26. *O. Bernoulliana*.
 - F. Flowers dioecious; inflorescences usually many and many-flowered.
 - G. Fruit 1.5 cm. long; cyathiform cupule covering $\frac{1}{3}$ its length... ..27. *O. cernua*.

- G. Fruit 2.5 cm. long; disk-like cupule with undulating margin not covering fruit.....28. *O. tenera*.
- E. Leaf-blades elliptic or lanceolate-elliptic or oblong-elliptic, never membranaceous; apex abruptly acuminate to obtuse but not usually caudate.
- F. Branchlets at the apex ferruginous-tomentellous, becoming brownish and glabrous; buds ferruginous- or yellowish-tomentellous.....29. *O. paradoxa*.
- F. Branchlets at the apex not ferruginous-tomentellous; buds not ferruginous- or yellowish-tomentellous.
- G. Leaf-blades subcoriaceous, shining, paler beneath, everywhere prominently reticulate.....30. *O. Matudai*.
- G. Leaf-blades not subcoriaceous or shining or paler beneath, the reticulation various.
- H. Lateral nerves 4-6 pairs; inflorescence 4-9 cm. long.....31. *O. Meziana*.
- H. Lateral nerves 8-10 pairs; inflorescence usually 12-15 cm. long.
- I. Flowers dioecious; branchlets blackish.....32. *O. pyramidata*.
- I. Flowers perfect; branchlets greenish.33. *O. laetivirens*.
1. *Ocotea stenoneura* Mez & Pittier in Bull. Herb. Boiss. II. 3: 233. 1903.

DISTRIBUTION: Known only from the type-locality and adjoining areas in Costa Rica, 650-975 m. altitude, in forests.

COSTA RICA: San José: Hills near Las Vueltas, alt. 650-700 m., Feb. 1899, *Tonduz* 13377 (fr., photo. of LECTOTYPE of *O. stenoneura*, Ch, GH); forests of Las Vueltas, Tucurrique, *Tonduz* 12953 (fr., GH); forest in vicinity of El General, *Skutch* 3014 (fl., A, NY).

NATIVE NAME: "Ira Zopilote" (Costa Rica).

This species has stout conspicuously angled densely ferruginous-tomentose branchlets bearing leaves densely spiraled near the apex. The unusual petioles are actually very short and stout, less than 5 mm. long, but the conspicuously decurrent and recurved leaf-base forms an apparent petiole that is up to 2.5 (-3) cm. long, 6-7 mm. broad and closely and minutely appressed-ferruginous-tomentose throughout. The leaf-blades are coriaceous, obovate to elliptic, with the base cuneate (due to the recurved lower portion) and the apex shortly, abruptly, but very sharply acuminate, measuring 18-24 cm. in length and up to 9 cm. in breadth. The upper surface is shining and conspicuous for its pattern of regular venation and the minute conspicuous reticulation. The lower surface is glaucous and densely clothed with a soft fine ferruginous pubescence. The costa above is impressed and glabrous except for the lowermost portion; beneath it is thickly and prominently elevated and pubescent. The lateral nerves, of which there are 10-14 pairs, ascend without curving to the margin, and are evenly spaced and almost parallel with each other. They diverge from the costa at an angle of about 35°. The inflorescence is robust, densely ferruginous-tomentose, up to 25 cm. long, heavily flowered, the flowers densely tomentose throughout, practically sessile, campanulate, 5-6 mm. long, the fleshy and hairy perianth-lobes being up to 2.15 mm. long. The tube is very hairy within. The stamens of the two outer series are up to \pm 1.25 mm. long, with the roundish anthers nearly equalling the stocky pubescent filaments. Those of the inner series are squarish, the filaments bearing laterally two round conspicuous basal glands that are almost equal to the anthers in size.

The glabrous gynaecium is about ± 2.8 mm. long, the ellipsoid ovary nearly twice the length of the style, bearing an inconspicuous stigma. The stout infructescence may measure up to 25 cm. in length, still densely ferruginous-tomentose, according to the authors, but only grayish-pubescent and not as thickly so as is the case in the flowering stage. The fruit is subglobose, apiculate, roughish and minutely tuberculate near the apex, up to 2 cm. in diameter, and supported by a flat disk-like cupule about 12 mm. in diameter, the margin undulate and (according to Mez and Pittier) frequently bearing the remnants of the perianth-lobes. The gynophore is perceptible in the bottom of the empty cupule, although it is less than 1 mm. high. The stout woody pedicel is 5 mm. or more long and 3.5 mm. in diameter.

The relationship of this species will be discussed under *O. Seibertii* and also under *O. Cooperi*. In connection with the latter species, I discuss my selection of *Tondus 13377* as the lectotype of *O. stenoneura*.

2. *Ocotea Cooperi*, sp. nov.

Ocotea stenoneura Mez & Pittier in Bull. Herb. Boiss. II. 3: 233. 1903, quoad *Cooper 10217*, excl. *Tondus 13377*; sensu Standley in Field Mus. Publ. Bot. 18: 456. 1937.

Arbor(?), ramulis valde angulatis dense ferrugineo-tomentosis deinde griseo-tomentosis sulcatis. Folia alternata, petiolis robustis pubescentibus leviter canaliculatis, 1.5 mm. longis et 3 mm. latis, laminis supra glabris basi costae excepta, lucidis, subtus glaucescentibus molliter tomentosis, membranaceis, in sicco supra brunneo-olivaceis, oblongis, (15-) 35 cm. longis et (5-) 9.5 cm. latis, basi rotundatis vel obtusis, apice acuminatis, penninerviis, costa supra impressa basi pubescente subtus robusta valde elevata utrinque pubescente, nervis 10-15-paribus supra subobscuris subtus satis elevatis pubescentibus angulo 45-60° divergentibus, rete venularum utrinque prominulo. Inflorescentia axillaris et subterminalis, paniculata, foliis apicalibus deciduis, ad 20 cm. longis, ferrugineo-tomentosa, multiflora, pedunculo ad 7 cm. longo ferrugineo-tomentoso. Flores ad 5 mm. longi, pedicellis 2-3 mm. longis perianthii tubo urceolato intus glutinoso, lobis late ovatis vel subtriangularibus subexpansis crassis vel sublignosis ± 1.7 mm. longis; staminibus ser. I & II late spatulatis ad $\pm .6$ mm. longis antheris oblongo-truncatis filamentis aequalibus, ser. III + .8 mm. longis conspicue biglandulosis, glandulis sessilibus et antheris filamentis aequalibus; staminodiis lanceolatis gracilibus pubescentibus + .6 mm. longis; gynaecio glabro ± 2.5 mm. longo, ovario conspicue stipitato, late ovoideo gynaecii dimidium longitudine parum excedente, et stylo robusto duplo longiore, stigmate triangulari subdiscoideo conspicuo styli lateribus decurrente. Fructus ellipsoideus, minute apiculatis, 3.5 cm. longus et 1.8 cm. latus, cupula lignosa subhemisphaerica rugosula ad 1.5 cm. longa, 2 cm. diam., et 11 mm. alta, margine suberosa tenui subtentus, pedicello crasso ad 1 cm. longo apice 5 mm. expanso.

DISTRIBUTION: Costa Rica and adjacent Panama at 675-900 m. altitude.

COSTA RICA: Limón?: Santa Clara, *J. J. Cooper 10217* (fr., isosyntype of *Ocotea stenoneura*, US). San José: El General, *Skutch 4757* (fl., A, Ch, NY). PANAMA: Bocas del Toro: Changuinola Valley, *G. P. Cooper & G. M. Slater 96 (Y10277)* (fl., Ch, TYPE — GH, Y); Cricamola, region of Almirante, *G. P. Cooper 498* (fl., Ch).

NATIVE NAMES: "Quizarra amarillo" (Costa Rica); "Sweetwood," "Yaya" (Panama).

The urceolate tube and spatulate anthers of the rather lignified and often exceedingly large inflorescence distinguish this species from others known from this area. It is of course most nearly related to *O. stenoneura* Mez & Pittier. Since their description agrees with *Tonduz 13377* rather than with the other syntype, *Cooper 10217*, the former was retained as the lectotype of *O. stenoneura*, and the latter placed with Costa Rican and Panamanian specimens with which it seems to belong. The long apparent petioles with the blades decurrent for almost their entire length, and conspicuously recurved, separate *O. stenoneura* from *O. Cooperi*, as well as the smaller globose fruit subtended by the shallow disk-like undulate-margined cupule.

3. *Ocotea Seibertii*, sp. nov.

Arbor 22.5–30 m. alta, ramulis griseis mox griseo-rubescenti-maculatis angulatis mox striatis vel sulcatis juventute pubescentibus mox glabrescentibus vel glabris. Folia alternata, glabra, petiolis \pm gracilibus vel robustis, glabris, canaliculatis, ad 12 (–17) mm. longis et 2 (–2.5) mm. latis, laminis utrinque glabris interdum basi subtus costa nervisque exceptis, coriaceis, in sicco viridescens, supra valde subtus haud nitidis, ellipticis, 12–15 (–21) cm. longis et 4.5–6 (–9) cm. latis, basi cuneatis interdum leviter obliqui apice leviter obtuso-acuminatis, margine recurvatis, penninerviis, costa satis crassa supra leviter subtus valde elevata rubescente vel flavescente, nervis 6 (–9)-paribus supra haud subtus conspicuiore elevatis angulo 35–45° divergentibus, rete venularum juventute utrinque satis conspicuo mox supra laxo subtus valde minute conspicuo. Inflorescentia axillaris, paniculata, ad 13 cm. longa, juventute pubescens mox glabrescens, rubescens, longipedunculata, pedunculo ad 6 cm. longo. Flores ad 3 mm. longi, pedicellis ad 3 mm. longis, gracilibus, perianthio vadoso infundibuliformi, lobis \pm oblongis, subacutis, crassis, extus pubescentibus intus dense papilloso-pubescentibus, \pm 2.8 mm. longis, staminibus ser. I & II \pm 1.25 mm. longis, antheris oblongo-subrectangularibus filamento duplo longioribus, ser. III \pm 1.7 mm. longis, conspicue biglandulosis, glandulis staminibus partem tertiam aequantibus; staminodiis subsessilibus \pm .6 mm. longis ovatis; gynaecio glabro \pm 2.15 mm. longo, ovario subgloboso vel obovoideo, stylo aequali, stigmate discoideo conspicuo. Fructus viridis, fide coll. globosus vel leviter obovoideus, apiculatus, rugosulus, 2.3 \times 2 cm., cupula subcampanulata rugosula glabra rubra, 5 mm. longa, 3 mm. diam., et 3 mm. alta, margine undulata, gynophorio bene incrassato ad 2 mm. longo et 6 mm. diam. subtentus, pedicello incrassato glabro, 4–8 mm. longo.

DISTRIBUTION: Lowland forests of Costa Rica and Panama.

COSTA RICA: Alajuela: Lechería on Poás, alt. 2285 m., July 30, 1932, *Stork 3377* (fl., TYPE, Ch) (tree 22.5–30 m.; felled for lumber); forests of El Copey, *Tonduz 11939* (fr., GH). PANAMA: Chiriquí: Valley of the Upper Río Chiriquí Viejo of Monte Lirio, *R. J. Seibert 308* (fr., A, Ch, Mo, NY); Chiriquí Viejo Valley, *G. White 96* (fr., Ch, GH, Mo).

NATIVE NAMES: “Quisarrá,” “Quizarrá” (Costa Rica); “Sigua amarilla” (Panama).

The nearest affinities of *O. Seibertii* seem to be *O. stenoneura* and *O. Cooperi*, both of which are easily separable because of the tomentum on the lower leaf-surface. The fruit of *O. Cooperi* is ellipsoid and borne in deep subhemispherical cupules. That of *O. stenoneura* is globose and borne on more disk-like cupules, than that of *O. Seibertii*.

4. *Ocotea palmana* Mez & J. D. Smith in Bot. Gaz. 33: 258. 1902; Standley in Field Mus. Publ. Bot. 18: 455. 1937.

DISTRIBUTION: Costa Rica and Panama at about 1500 m. altitude.

COSTA RICA: Alajuela: Los Angeles and La Paz de San Ramón, Brenes 6092 (fl., Ch). San José: In the forests of La Palma, alt. 1500 m., Nov. 1898, Tondus 7374 (12652 Herb. Nat. Costa Rica) (fl., ISOTYPE, GH, NY); Platanares Moravia, W. W. & H. E. Rowlee 210 (sterile, NY); La Palma, W. W. & H. E. Rowlee 233 (fl., Ch). PANAMA: Bocas del Toro: Fish Creek Mts., vicinity of Chiriquí Lagoon, von Wedel 2264 (fr., A).

NATIVE NAME: "Ira mangle" (Costa Rica).

The stout branchlets of this species are angled and densely, shortly, and minutely ferruginous-tomentose. The leaves are borne on thick petioles that are also pubescent, striate, and up to 3 cm. long and 4 mm. broad. The blades are rigidly coriaceous, obovate, cuneate at the base, rounded, and very shortly, abruptly, and obtusely acuminate to acutely acuminate at the apex, measuring up to 25 cm. long and 14 cm. broad. The blades are glabrous above, except for the venation, and beneath are covered with a dense fine close ferruginous tomentum. The broad costa is scarcely elevated above, though prominently so beneath. The lateral nerves, of which there are 8-10 pairs, are slender and delicately and slightly elevated above and conspicuously so beneath and diverge at an angle of about 55°. The inflorescence is stout, densely ferruginous-tomentose, axillary, paniculate, rather few-flowered, about 8 cm. long, the peduncle not more than 2 cm. long. The flowers are large, 5-6 mm. long and about 12 mm. in diameter, and densely tomentose, the ovate lobes almost leathery, \pm 3.8 mm. long. The stamens of the outer series have short filaments and the anthers are ovate or rounded; those of the inner series are longer, with the filaments nearly equalling the oblong rounded anthers and completely covered by the large sessile roundish basal glands equalling the anthers in size. The glabrous gynaecium consists of an ellipsoid ovary topped by a rather stout style of nearly equal length bearing a capitate stigma. The fruiting specimen from Panama has branchlets that are less ferruginous than tawny-brown-tomentose, and thicker shorter petioles subtending blades that are more rounded at the base and less pubescent. The fruit is green, ellipsoid, oblong, up to 3.5 cm. long and 1.6 cm. broad, subtended by a pink cupule that is subcampanulate and very thin-margined, up to 6 mm. long, about 15 mm. in diameter, and about 5 mm. deep, the supporting pedicel nearly 2.5 cm. long and expanded to nearly 1 cm. in diameter at the tip.

The species is related to *O. mollifolia*, under which it is further discussed.

5. *Ocotea mollifolia* Mez & Pittier in Bull. Herb. Boiss. II. 3: 233. 1903; Standley in Field Mus. Publ. Bot. 18: 455. 1937.

DISTRIBUTION: Known only from the type-locality.

COSTA RICA: Limón: Hacienda Victoria, forests of the plains of Zent, alt. 200 m., Feb., 1900, Pittier 16031 (fl., fr., TYPE not seen), 16030 (fl., GH).

This species has slender striate terete branchlets densely clothed with a fine close short ferruginous tomentum, which persists on the short rather thick petioles measuring not more than 7 mm. in length. The chartaceous blades are subelliptic or usually obovate-elliptic, with the base cuneate and the apex abruptly short- or long-caudate-acuminate, measuring up to 24 cm. long and to 9 cm. broad. They are glabrous above except for the

midrib and covered beneath with a soft pubescence which is conspicuously ferruginous on the venation. The costa and lateral nerves, of which there are about 10 pairs, diverging at an angle of $35-45^\circ$, are very slightly elevated above and prominently so beneath. The reticulation, visible above, is very conspicuous beneath. The very slender inflorescence is axillary or subterminal, paniculate, few-flowered, shortly densely ferruginous-pubescent throughout, up to 9 cm. long, the weak peduncle not more than 5 cm. long at most. The flowers are about 4 mm. long, subtended by a slender pedicel of equal length, both densely ferruginous-pubescent. The equal perianth-lobes (subequal according to Mez) are broadly ovate, acute (almost round according to Mez), thick, fleshy and slightly papillose within, nearly 3 mm. long. The stamens of the two outer series are ± 1.25 mm. long, the ovate anthers papillose at their round or obtuse tips, and only slightly longer than the broad pubescent filament which gradually expands toward its junction with the anther. Those of the inner series are ± 1.7 mm. long, the anthers oblong and equal to the pubescent filaments, which are covered one-half their length by large subsessile glands that are almost confluent. The gynaecium is ± 2.15 mm. long, the ellipsoid glabrous ovary slightly longer than the tapering pubescent style, which bears a conspicuous distinctly capitate stigma. The fruit, according to Mez, is large, ellipsoid, up to 3.5 cm. long, and about 1.5 cm. in diameter.

Although the type is not available for study, the number collected by Pittier presumably at the same time in essentials agrees precisely with the type. Mez mentions the shorter flower and the unequal lobes of the perianth, both characters which may vary in the same inflorescence. He mentions *O. Salvini* and *O. palmana* as being near *O. mollifolia*, but differing because of the strongly pilose style. The former has been transferred by Lundell to the genus *Phoebe*. The latter is generally a far more robust species in foliage and inflorescence-characters.

6. *Ocotea Ira* Mez & Pittier ex Mez in Bull. Herb. Boiss. II. 3: 232. 1903; Standley in Field Mus. Publ. Bot. 18: 455. 1937.

DISTRIBUTION: Costa Rica and adjacent Panama, in the lowlands, or at not more than 200 m. altitude.

COSTA RICA: Limon?: Llanuras de Santa Clara, alt. 200 m., June, 1899, *Pittier* 7608 (13999 Herb. Nat. Costa Rica) (fl., LECTOTYPE, US). PANAMA: Bocas del Toro: Region of Almirante, Cricamola Valley, *G. P. Cooper* 532 (fr., Ch, NY); Water Valley, *von Wedel* 720 (fl., A); vicinity of Chiriquí Lagoon, *von Wedel* 1382 (fl., A). Chiriquí: in lowlands, *Cooper & Slater* 218 (Y 10571) (sterile, Y); Progreso, *Cooper & Slater* 309 (Y 10660) (fl., Ch, Y).

NATIVE NAMES: "Ira" (Costa Rica); "Aguacaton" (Panama).

This species has branchlets that early lose their closely appressed brownish almost setaceous pubescence, becoming glabrous, angled, and darkish. The leaves are borne on petioles that are strongly or in some cases slightly winged, the blade being decurrent and recurved for nearly 4 cm., forming an apparent petiole; or the distinctly winged petiole may measure up to 1 cm. in length. The blades are subcoriaceous to rigid, glabrous to glabrescent, with frequently inconspicuous axillary glands, obovate, attenuately cuneate at the base and recurved, the apex abruptly and obtusely cuneate. They are up to 25 cm. long and 9.5 cm. broad. The costa is broad and conspicuous above, although slightly impressed, and prominently

elevated beneath. The slender lateral nerves, of which there are 9–12 pairs, are very slightly elevated above and more so beneath, diverging at an angle of about $35\text{--}45^\circ$, curving toward the marginal region, the reticulation being inconspicuous above and conspicuous and frequently pubescent beneath. The inflorescence is axillary and subterminal, paniculate, many-flowered, brownish-pubescent, becoming glabrous, up to 15 cm. long, the stout peduncle up to 7 cm. long. The flowers are small, ± 2.15 mm. long, pubescent without, the slender pubescent pedicel about the same length; the rather thick papillose ovate acute lobes are ± 1.4 mm. long. The stamens of the two outer series are ± 1.25 mm. long, the ovate obtuse anthers scarcely longer than the slender filaments. Those of the inner series are ± 1.7 mm. long, the subrectangular truncate anthers not quite equalling the pubescent filaments, with two subglobose subsessile glands about half the length of the filaments. The glabrous gynaeceum measures up to ± 2.4 mm., the subellipsoid ovary slightly longer than the slender style with a subtriangular subdiscoïd stigma. Mature fruit of the species is unknown.

Mez & Pittier cite two syntypes, the number cited above, *Pittier 7608* (13999), and the number 10415. The latter certainly corresponds not to the description of *O. Ira*, but to that of *O. cuneata* (*O. Tonduzii*). It does not match the only other number cited. Mez himself says that no. 10415 differs from *O. cuneata* (*O. Tonduzii*) and is more nearly related to *O. pedalisfolia*, *O. pentagona*, and *O. insularis*, but differs from them in shape of leaves, the inflorescence, and smaller flowers. The species seems to me to be closely allied with the group of specimens of which *O. Tonduzii* is a member, because of the decurrent leaf-bases and the shape of the blades, although it does differ presumably in floral characters and the shape of the cupule. The leaves of the *O. Tonduzii* group (according to the original description) are on the whole much smaller than those of *O. Ira*.

7. *Ocotea Wedeliana*, sp. nov.

Arbor 3–12 m. alta, ramulis minute et inconspicue pubescentibus mox glabris, plus minusve angulatis vel alatis, brunneis, rubescentibus vel griseis. Folia petiolis saepe robustis canaliculatis pubescentibus ad 1 cm. longis, laminis membranaceis opacis juventute fulvo-sericeis celerrime glabris, obovatis vel ellipticis basi cuneatis apice obtusis acuminatis vel longe caudato-acuminatis, ad 26 cm. longis et 9.5 cm. latis, penninerviis, costa supra impressa subtus elevata, nervis lateralibus 8 vel 9 paribus, supra leviter subtus prominenter elevatis, angulo $35\text{--}45^\circ$ divergentibus, rete venularum supra obscuro subtus satis prominulo. Inflorescentia axillaris vel subterminalis paniculata ad 12 cm. longa, glabrescens, pauciflora, pedunculo gracili ad 7.5 cm. longo. Flores fulvo-pubescentes, ad 3.5 mm. longi, pedicellis gracilibus ad 4.25 mm. longis, perianthii tubo conspicuo, lobis late ovatis acutis crassis ± 2.15 mm. longis; staminibus ser. I & II ± 1.25 mm. longis antheris ovatis obtusis 4-plo filamentis robustis pubescentibus longioribus, ser. III ± 1.5 mm. longis antheris basi pubescentibus anguste ovatis filamentis biglandulosis duplo longioribus, glandulis reniformibus conspicuis sessilibus filamentis aequalibus; staminodiis nullis; gynaeceo glabro ± 1.7 mm. longo, ovario subgloboso stylo gracili aequali, stigmate conspicuo discoideo. Fructus globosus, glaber, viridis, ad 1 cm. diam.,

cupula vadosa undulata rubra ad 2 mm. longa et alta et 8 mm. diam. subtentus, pedicello rubro glabrescente ad 8 mm. longo et 2 mm. diam. apice expanso.

DISTRIBUTION: Known only from Bocas del Toro, northern Panama, at 375 m. altitude.

PANAMA: Bocas del Toro: Without locality, *Wedel* 388 (fr., A), *G. P. Cooper* 399 (fl., fr., Ch, TYPE — GH) (tree 12 m., diam. 10 cm., with long clear very slender bole; receptacle reddish, fruit green with white meaty pulp inside), 399a (fl., Ch, NY); Buena Vista Camp, on Chiriquí Trail, *Cooper* 603 (Y 12236) (fr., Ch, NY).

NATIVE NAME: "Sigua" (Panama).

This species is not, in foliage and floral characters, so very different from *O. nicaraguensis*, the principal difference being in the texture and size of the leaf-blades.

8. *Ocotea subalata* Lundell in *Lloydia* 4: 48. 1941.

DISTRIBUTION: Known only from the type-locality.

MEXICO: Chiapas: Volcán Tacaná, on north side, alt. 2100 m., April 2, 1939, *Matuda* 2957 (fl., fr., ISOTYPE, A, Ch, NY).

This species, known only from the type-material, has branchlets that are brownish-hirsute, becoming glabrescent, angled (subalate), and striate. The leaves have petioles that are hirsute, canaliculate, and up to 2 cm. long. The blades are glabrous above and glabrescent beneath, chartaceous, narrowly obovate or broadly oblanceolate, the base cuneate or almost obtuse, the apex usually abruptly and obtusely acuminate, 8–21 cm. long and 4–8.3 cm. broad. The broad costa is only slightly depressed above and prominently elevated beneath; the lateral nerves, of which there are 6–9 pairs, are obscure above and also prominently elevated beneath, the reticulation being minute and conspicuous throughout. The inflorescence is axillary, few-flowered, panicleate, pubescent to glabrescent, up to 12 (–?) cm. long, the blackish glabrescent peduncle measuring up to 7 cm. in length. The flowers are brownish-hirsute, about 2.5 mm. long, and borne on pedicels to 4 mm. long. The specimens at hand bear flowers that are too little developed for satisfactory dissection, but the author describes a short perianth-tube, ovate obtuse lobes, filaments about half as long as the ovate obtuse anthers and sparsely appressed-puberulent, the filaments of the inner series bearing conspicuous sessile glands, the ovary glabrous, somewhat longer than the style, the latter sparsely puberulent. The inflorescence expands in the fruiting stage to a rather robust structure up to 25 cm. long with a stout peduncle. The shining black ellipsoid fruits measure up to 2.5 cm. long and 1.7 mm. in diameter, and are subtended by an exceedingly shallow undulating woody cupule 3–4 mm. long and deep and about 1 cm. in diameter. The sturdy pedicel is glabrous, longitudinally rugose, and up to 2.5 cm. long, expanded equally throughout to a diameter of about 3–4 mm.

The nearest relative of *O. subalata* seems to be *O. verapazensis*, but the latter is easily distinguished by the differences in fruit-characters, particularly the deeper and even more woody cupule, and the presence of conspicuous glands. There is a superficial resemblance to *O. Wedeliana*, but again the small globose fruit of the latter, supported by a small unligified cupule, unquestionably separate the two entities.

9. *Ocotea eucuneata* Lundell in Contr. Univ. Mich. Herb. 6: 16. 1941.

DISTRIBUTION: From British Honduras along high ridges south to Guatemala, along rivers and in mountains up to 1200–2000 m. altitude.

GUATEMALA: Huehuetenango: Cerro Chiblac, between Finca San Rafael and Ixcán, Sierra de los Cuchumatanes, *Steyermark* 49183 (fl., Ch). Izabal: Along Río Tameja, *Steyermark* 41769 (fr., Ch), 41797 (fr., Ch). BRITISH HONDURAS: Stann Creek: Middlesex, in high ridge, Oct. 27, 1939, *Gentle* 3068 (fl., ISOTYPE, A, NY) (a large tree about 75 cm. in diameter; flowers creamish).

NATIVE NAME: "Timbersweet" (British Honduras).

A species with slender branchlets minutely, shortly, and inconspicuously pubescent, becoming glabrous and angled. The petioles also are slender and minutely pubescent, canaliculate, up to 1.5 cm. long at most. The blades are very thinly membranaceous, obovate, the base attenuately cuneate, the apex abruptly acuminate, up to 16 (occasionally 23) cm. long and 5 (occasionally 8) cm. broad, glabrescent on both surfaces. The costa and lateral nerves, of which there are 8 or 9 pairs diverging at an angle of about 35°, with inconspicuous pubescent axillary glands, are very slightly elevated above and very prominently so beneath. The inflorescence is axillary-subterminal, paniculate, grayish-pubescent to glabrous, up to 9 cm. long, the comparatively stout peduncle no more than 2.5 cm. long. The pubescent flowers are small, not more than 2.5 mm. long, the slender pedicel 3 mm. or less long. The perianth-tube is conspicuous, the ovate acutish lobes thinnish, up to 1.8 mm. long. The stamens of the two outer series are almost 1 mm. long, the ovate roundish anthers slightly longer than the pubescent filaments. Those of the inner series are somewhat longer, the anthers more oblong, the filaments bearing two subreniform conspicuous stipitate glands at the base. The glabrous gynaeceum is \pm 2.15 mm. long, the subglobose ovary surmounted by a slender style twice its length and bearing a conspicuous capitate stigma at its apex. The infructescence often retains the pubescence of the early stage. The fruit is oblong, slender, dull green, according to the collector, up to 2 cm. long and 6–10 mm. broad, subtended by a shallow lobed brittle cupule that is dull red, measuring up to 2 mm. long and deep and 8–9 mm. in diameter. The pedicel is enlarged to nearly 5 mm. long and is expanded to about 3 mm. in diameter at the apex. The branchlets of the fruiting specimens are much more densely pubescent than those of the flowering material.

The species is most nearly related to *O. subsericea*. It may be distinguished from this species by its leaves reaching a length of not less than 15 cm., as opposed to 12 cm. in *O. subsericea*, and by its much smaller thinner cupule.

10. *Ocotea verapazensis* Standley & Steyermark in Field Mus. Publ. Bot. 23: 114. 1944.

DISTRIBUTION: Known only from Guatemala, usually in wet forests at an altitude of 50 m. along river-banks in Izabal, and at 300–2000 m. in the mountains of Alta Verapaz and San Marcos.

GUATEMALA: Alta Verapaz: Dense wet forest in mountains east of Tactic, on road to Tamahú, *Standley* 71163 (fl., Ch), April 9, 1939, 71421 (fl., fr., TYPE, Ch) (tree 6 m.; flowers green; cupule red). Izabal: Along Río Tameja, *Steyermark* 41789 (fr., Ch). San Marcos: Between Finca El Porvenir and Loma Corona on forested slopes 9 miles northwest of El Porvenir, southwest-facing slopes of Volcán Tajumulco, *Steyermark* 37752 (fl., Ch).

The branchlets of this species are distinctly angled and in the early stages

are glabrescent and dark brown, shortly becoming glabrous, mottled dark brown, and pale buff-brown. The petioles are, on the mature branchlets, yellowish brown, canaliculate, and sturdy, measuring up to 1.5 cm. long. The chartaceous blades are opaque above, shining beneath, oblong-elliptic or obovate-lanceolate, the base cuneate and often very narrowly and obscurely decurrent and recurved for half a millimeter's length, the apex abruptly and usually shortly obtusely acuminate, 14–24 (–27) cm. long and 4.5–7 (–8) cm. broad. The costa is often yellowish or reddish, slightly elevated but conspicuous above and more prominently so beneath. The lateral nerves, numbering up to 9 at most, are inconspicuous above and prominently elevated beneath, diverging arcuately at an angle of about 35–45°, sometimes with rather inconspicuous axillary glands. The minute reticulation is obscure above but very conspicuous beneath. The rather weak axillary or subterminal inflorescence is very slender, rather few- to many-flowered, up to 15 cm. long, glabrous for the most part, with a peduncle that is not more than 5 cm. long, usually less. The glabrous flowers are up to 2.5 mm. long, the slender pedicel less than 3.5 mm. long, the perianth very narrowly campanulate, the lobes elliptic, acutish, ± 1.9 mm. long, rather thick. The stamens of the two outer series are ± 0.9 mm. long, the anthers ovate, nearly twice the length of the filaments, with the short connectives obtusely but shortly acuminate. Those of the inner series are ± 1.3 mm. long, the anthers ovate with short obtuse connectives, the filaments bearing two conspicuous basal subsessile glands. The slender linear attenuate pubescent staminodia are ± 0.55 mm. long. The glabrous gynaecium is about 1.4 mm. long, the ellipsoid ovary nearly twice the length of the slender style bearing an inconspicuous stigma. The fruit is shining, ellipsoid, up to 2.5 cm. long and 1.8 mm. broad, subtended by a red woody fluted cupule that is 6 mm. long, up to 1.5 cm. in diameter, and about 4 mm. deep. The pedicel is longitudinally grooved, about 1.5 cm. long, and expanded to 8 mm. in diameter at the apex.

The species in floral structure recalls *O. laetivirens*, but has a much more robust habit and coarser bark and infructescences.

11. *Ocotea nicaraguensis* Mez in Jahrb. Bot. Gart. Berlin 5: 238. 1889.

Ocotea pentagona Mez in Bot. Jahrb. 30: Beibl. 67: 17. 1901.

Ocotea pedalifolia Mez in op. cit. 19.

DISTRIBUTION: Costa Rica and adjacent Nicaragua, at 200–915 m. altitude.

NICARAGUA: San Juan del Norte: Near San Juan, along the southern boundaries, *Friedrichsthal* 627 (fr., photo. of TYPE of *Ocotea nicaraguensis*, Ch, NY). COSTA RICA: Alajuela: Banks of the Río Naranjo, near San Mateo, alt. 200–250 m., March, 1893, *Tonduz* 7613 (fr., isosyntype of *Ocotea pentagona*, US); margins of “La Quebrada” Machuca, in “La Calera” de San Ramón, *Brcnes* 22644 (7) (fl., Ch). Limón: Forests of Shiroes, Talamanca, alt. 100 m., Feb., 1895, *Pittier & Tonduz* 9172, 9179 (fl., fr., isosyntypes of *Ocotea pedalifolia*, US). San José: Vicinity of El General, *Skutch* 2813 (fl., GH, NY); in forest on ridge overlooking Canaan, between Rivas and peak of Chirripó Grande Mt., *Danforth* 38 (Y 32963) (fl., Y). Cartago: Near Turrialba, *Tonduz* 7106, 8362 (fl., syntypes of *O. pentagona* not seen); bank of Río Tuis, *Pittier* 11347 (fl., GH).

The present species has usually very characteristically angled rather stout glabrous branchlets that are early minutely ferruginous-tomentellous, presently becoming grayish or reddish brown, smooth, and often even more sharply angled. The enormous leaves have very stout dark canaliculate petioles which are tomentose on the ventral surface and measure up to 1.5

cm. long. The blades are heavily coriaceous, more or less opaque above, slightly darker beneath, obovate-elliptic or oblanceolate, the base obtuse, subrounded, or cuneate, often attenuately so, the apex abruptly and shortly acutely or obtusely acuminate. They measure up to 55 cm. long, although they are usually about 30 cm., and vary from 6–15 cm. in breadth. The costa is exceedingly broad (up to 5 mm.), usually only slightly elevated above and more prominently so beneath. The lateral nerves, of which there are 10–12 (–15) pairs, with the lowermost and uppermost obscure, are slightly elevated above and more prominently so beneath, and diverge from the costa at an angle of 35–55°. The reticulation is very prominent beneath, slightly less so above. The axillary and subterminal paniculate inflorescence, 15–30 cm. in length, is glabrous or glabrescent, borne on a stout brownish or reddish brown angled striate peduncle up to 10 cm. long. The flowers are up to 2.5 mm. long, glabrescent without; the glabrous to glabrescent slender pedicel is up to 5 mm. long, the tube well defined, the ovate or broadly ovate acute thinnish lobes \pm 1.7 mm. long, and frequently broader than long at the base. The stamens of the two outer series have the anthers ovate, frequently with a definite connective, measuring \pm 1.5 mm. overall, about twice the length of the pubescent filaments. Those of the inner series are \pm 1.7 mm. long, the more narrowly ovate anthers three times the length of the filaments, which bear at the base two conspicuous ovate cordate short stipitate glands which are about half the length of the anthers. The glabrous gynaeceum is \pm 2.4 mm. long, the ovoid ovary about equal to the stout style topped with the discoid stigma. The ellipsoid smooth shining fruit, about 17 mm. long and 1 cm. broad, is borne on a shallow irregularly lobed cupule not more than 2 mm. long and deep and 8 mm. in diameter. The expanded deeply aciculate pedicel is up to 5 mm. long and 3–4 mm. broad at the tip.

Tonduz 7613 is annotated, presumably by Mez, as "*Ocotea paradoxa* Mez, n. sp.," but it is the syntype of *O. pentagona* and is a very good match for *Pittier & Tonduz 9172*, the fruiting syntype of *O. pedalisifolia*. Although only a photograph of the type of *O. nicaraguensis* is at hand, I am reasonably certain of the numbers being conspecific.

12. *Ocotea Standleyi*, nom. nov.

Phoebe macrophylla Standley & Steyermark in Field Mus. Publ. Bot. 23: 116. 1944, non Mez.

DISTRIBUTION: Known at present only from Guatemala, at an altitude of 1200–2700 m., usually in wet forests.

GUATEMALA: Alta Verapaz: Southeast of Tactic, in wet forest, alt. about 1500 m., March 30, 1939, *Standley 70009* (fl., fr., TYPE, Ch); wet forest near Tactic, above the bridge across Río Frio, *Standley 90429* (sterile, Ch); wet mixed forest, mountains along road between Tactic and the divide on road to Tamahú, *Standley 91326* (fl., Ch). San Marcos: Wet forest, Barranco Eminencia, road between San Marcos and San Rafael Pie de la Cuesta, in upper part of the barranco between Finca La Lucha and Buena Vista, *Standley 86538* (sterile, Ch). Quezaltenango: Dense mixed forest, along old road between Finca Pirineos and Patzulín, *Standley 86927* (fr., Ch).

This large tough-leaved tree or large shrub has stout branchlets that are slightly angled, striate, glabrous, and castaneous or reddish brown. The heavy glabrous subcanaliculate petioles are the same color, which continues up into the stout broad costa, and they measure up to 2.5 cm. long and about 3 mm. in thickness. The blades are heavily coriaceous, glabrous

throughout, elliptic or obovate-elliptic, the base obtuse or rounded and occasionally with a slight tendency toward being cordate, the apex rounded or obtuse or possibly shortly abruptly subacuminate, up to 30 cm. long and 12 cm. broad. The costa is conspicuous above, although impressed slightly, the lateral nerves, of which there are upwards of 12 pairs, diverging at an angle of about 45° , are slightly elevated above, and both costa and nerves are prominently elevated beneath. The reticulation is apparent although not prominent above, but conspicuously so beneath. The inflorescence is surprisingly slender for such leathery foliage, consisting of axillary panicles that are glabrescent, becoming glabrous, up to 14 cm. long, rather comparatively few-flowered, the peduncle up to 5.5 cm. long. The flowers and pedicels are each about 3 mm. long and pubescent. The tube is well developed and the lobes are broadly ovate (broader than long), thick, and ± 1.9 mm. long. The stamens of the two outer series are ± 1 mm. long, the subovate anthers only slightly longer than the slender filaments. Those of the inner series are ± 1.7 mm. long, the anthers being oblong or rectangular and equalling the filaments, which are completely covered by enormous lobed glands arising from the base. The staminodia are slender stipitate bodies, pubescent toward the base, the apical portion subrhomboid, measuring in their entirety about 0.6 mm. long. The glabrous gynaeceum measures ± 1.7 mm. long, the subglobose ovary equalled by the tapering style, which bears a subtriangular stigma that is decurrent. The fruit is green (subcastaneous in the dried state), ellipsoid, minutely apiculate, measuring up to 2 cm. long and 1.5 cm. broad, supported by a shallow cupule that is woody, cyathiform, roughly subferruginous-verruculose, and measuring 5–7 mm. long, 12 mm. in diameter, and 3 mm. deep; the pedicel is thickened and also verruculose, measuring up to 1 cm. long and about 4 mm. in diameter at the apex.

The size and texture of the leaves suggest *O. nicaraguensis*, but the smaller fruit of the latter has a lobed less woody cupule, and the floral structure differs.

13. *Ocotea atirrens* Mez & J. D. Smith ex Mez in Bot. Jahrb. 30: Beibl. 67: 18. 1901; Standley in Field Mus. Publ. Bot. 18: 454. 1937.

DISTRIBUTION: Costa Rica and adjacent Panama, usually at an altitude of 700–850 m., though it is found as high as 1550 m.

COSTA RICA: Alajuela: San Luis de Zarcero, in shady forest of Pacific cloud-forest zone, *A. Smith H.577* (fl., Ch); Villa Quesada, San Carlos, shade of Caribbean rain-forest, *A. Smith H.1737* (fl., A, Ch); La Palma de San Ramón, *Brenes 20596* (fl., Ch); near Río Naranjo, *Pittier* (Herb. Inst. Costa Rica 7592 b) (fl., SYNTYPE not seen). Cartago: Vicinity of Pejivalle, in forest, *Skutch 4591* (fl., A); Atirro, alt. 700 m., March, 1894, *J. D. Smith 4930* (fr., ISOSYNTYPE, US). PANAMA: Bocas del Toro: Vicinity of Chiriquí Lagoon, *von Wedel 1399* (fl., A).

NATIVE NAME: "Quizarrá" (Costa Rica).

This species is characterized by rubescent angled branchlets that are early covered with a dense minute ferruginous pubescence which quickly disappears, leaving the branchlets glabrescent or glabrous. The leaves are borne on stout canaliculate petioles, glabrescent except for the residue of dense pubescence in the groove, and up to 1.5 cm. long. The blades are glabrous to glabrescent, membranaceous, opaque above and darker beneath, oblong or oblanceolate-elliptic, the base roundish, obtuse or obtusely cuneate, the apex caudate-acuminate, up to 38 cm. long and 10–13 cm.

broad. The broad costa is impressed above and the lateral nerves, of which there are 12-16 pairs, diverging at an angle of 45° , are rather obscure, but all are elevated prominently beneath. The reticulation is visible, although only slightly raised above but prominently so beneath. The axillary paniculate inflorescence is 15-20 cm. long, pubescent, becoming glabrescent, the peduncle up to 8 cm. long. The glabrescent flowers are up to 3 mm. long, with a short glabrescent pedicel not more than 2 mm. long. The lobes are thinnish, ovate-elliptic or even broadly ovate, obtuse, papillose within, ± 1.25 mm. long. The stamens of the two outer series measure about 0.8 mm., the ovate subrotund or obtuse anthers being twice the length of the filaments. Those of the inner series are ovate, obtuse, ± 1.25 mm. long, the anthers supported by filaments slightly shorter and bearing two subreniform sessile glands at the base. The glabrous gynaecium is ± 1.7 mm. long, the ovoid to subglobose ovary equalling the style, that bears an obtuse usually inconspicuous stigma at its apex. The black fleshy ellipsoid fruit measures up to 3.3 cm. long and at least 1.5 cm. broad. The cupule seems to be a shallow disk-like undulate-margined structure measuring up to 8 mm. in length and diameter, and less than 2 mm. deep. The supporting pedicel is very short and slightly enlarged to 2 mm. at the apex. A better prepared fruiting specimen of the species may change this concept of the cupule-structure and dimensions.

Ocotea atirrensis stands out because of the very long oblanceolate leaves, which are membranaceous. The species is perhaps more nearly related to *O. Paulii* than to any other of this region, but it is easily separated by the texture of the leaves and the different type of reticulation.

14. *Ocotea Paulii*, sp. nov.

Arbor ad 15 m. alta, ramulis angulatis brunneis mox griseis glabris sulcatis. Folia alternata, glabra, petiolis robustis glabris atro-rubrescentibus 1 (— 1.5) cm. longis et 1.5-2.5 mm. latis, laminis utrinque glabris, coriaceis, in sicco plus minusve viridescenti-brunneis, oblongis, ad 20 cm. longis et 5-6.5 cm. latis, basi cuneatis, saepe abrupte cuneatis, apice abrupte et obtuse acuminatis vel rotundatis vel obtusis, interdum emarginatis, penninerviis, costa utrinque crassa rubescente supra satis subtus conspicue elevata, nervis 8-12-paribus supra inconspicue subtus conspicue elevatis angulo 35° divergentibus, rete venularum utrinque nonnihil prominulo. Inflorescentia axillaris vel subterminalis, late paniculata, ad 25 cm. longa, rubescens, glabrescens, multiflora, pedunculo rubescente, ad 6 cm. longo. Flores ad 2 mm. longi, pedicellis ± 2 mm. longis, gracilibus, perianthio campanulato, pallide flavescente, lobis late ovatis obtusis membranaceis, ± 1.25 mm. longis; staminibus ser. I & II ± 1 mm. longis, antheris ovatis filamentis duplo longioribus, ser. III ± 1.25 mm. longis, antheris ovato-quadratis, filamentis conspicue biglandulosis, glandulis stipitatis antheris subaequalibus; staminodiis nullis; gynaecio glabro, ± 1.7 mm. longo, ovario late ovoideo vel subglobose stylo aequali, stigmate conspicuo. Fructus atratus (in sicco), oblongus, 18-20 \times 10-11 mm., cupula subhypocrateriformi rugosula, glabra, ± 2 mm. longa et 5-6 mm. diam., 1 mm. alta, margine undulata, subtentus, pedicello satis incrassato, glabro, 3-4 mm. longo.

DISTRIBUTION: Panama, at an altitude up to 1100 m., and Costa Rica, up to 1450 m.

COSTA RICA: Alajuela: San Luis de Zarcero, edge of Pacific watershed cloud-forest, *A. Smith H. 633* (fl., Ch); woods, La Palma de San Ramón, *Brenes 5590* (181) (fl., Ch). PANAMA: Chiriquí: Between Cerro Vaca and Hato del Loro, *Pittier 5395* (fl., Ch). Coclé: Vicinity of El Valle, alt. 600-1000 m., Dec. 8, 1938, *Paul H. Allen 1211* (fl., Ch, TYPE — GH, Mo) (tree 15 m.; flowers pale yellow); south rim (dry), *Allen 1775* (fr., Ch, GH, Mo, NY); region south of El Valle de Anton, *Allen 2848* (fl., A).

The nearest affinity of *O. Paulii* is *O. atirrensis*, but the new species is quickly distinguished by the coriaceous leaf-blades which are bright brown on drying. The apex of the blades of *O. atirrensis* is definitely caudate.

15. *Ocotea Dendrodaphne* Mez in Jahrb. Bot. Gart. Berlin 5: 238. 1889; Standley in Contr. U. S. Nat. Herb. 27: 183. 1928.

Dendrodaphne macrophylla Beurling in Vet. Akad. Handl. Stockholm 1854: 145. 1856.

Ocotea Quisara Mez & J. D. Smith in Bot. Gaz. 33: 259. 1902; Standley in Field Mus. Publ. Bot. 18: 456. 1937.

Ocotea ovandensis Lundell in Contr. Univ. Mich. Herb. 6: 16. 1941.

DISTRIBUTION: Mexico through Guatemala, Honduras, and Costa Rica to Panama, from 200 to about 1250 m. altitude.

MEXICO: Chiapas: Mt. Ovando, Dec. 17, 1936, *Matuda 444* (fl., isotype of *O. ovandensis*, A, NY), 1839 (fr., A, NY). GUATEMALA: Quezaltenango: Colomba, in coffee plantation, *Skutch 1980* (fl., A, Ch, NY), by roadside, *Skutch 2007* (fl., A, Ch). HONDURAS: Province unknown, in forest near Bolet's plantation, *P. Wilson 351* (sterile, GH). Atlántida: Tela, near Lancetilla, *Bangham 214* (fr., Ch). COSTA RICA: Alajuela: Villa Quesada, San Carlos, in Caribbean rain-forest, *A. Smith F. 1765* (sterile, fl., A, Ch), 1771 (fl., A, Ch); Suere, *A. Smith F. 1849* (sterile, fl., A, Ch). Limón?: La Emilia, Llanuras de Santa Clara, alt. 250 m., April, 1896, *J. D. Smith 6751* (fl., isosyntype of *O. Quisara*, GH); La Concepcion, Llanuras de Santa Clara, alt. 250 m., Feb. 1896, *J. D. Smith 6756* (fr., isosyntype of *O. Quisara*, GH). Cartago: Volcán de Turrialba, *Tonduz 9020* (fr., Ch); Atirro, alt. 600 m., April, 1896, *J. D. Smith 6753* (syntype of *O. Quisara* not seen). PANAMA: Colón: Near Puerto Bello, *Billberg s.n.* (fl., TYPE of *Dendrodaphne macrophylla* not seen). Coclé: Hills north of El Valle de Anton, vicinity of La Mesa, *P. H. Allen 2299* (fr., Ch).

NATIVE NAMES: "Quisara" (Costa Rica); "Sigua" (Panama, fide Standley).

This species is striking because of the usually silvery-gray angled branchlets, early closely and minutely pubescent but soon glabrous. The blackish stout canaliculate glabrous petioles up to 2 cm. long offer a contrast to the branchlets. The blades are chartaceous, glabrous throughout, or with a few dark hairs persisting at the base on the lower surface, usually pale green to light brown in the dried state, elliptic or oblong-elliptic, the base obtuse or abruptly cuneate, rarely rounded and abruptly cuneate, the apex variable, obtuse, or acutish, or even acuminate to caudate-acuminate. The blades measure up to 30 cm. long and up to 10 cm. in breadth. The robust costa is slightly impressed above and prominently elevated beneath. The lateral nerves number 9 or 10 pairs and are delicately and imperceptibly elevated above and more prominently beneath, diverging at an angle of about 45°. The upper surface of the blades is very smooth, showing no sign of the minute and dense reticulation which is characteristic of the lower surface. The inflorescence consists of numerous subterminal puberulous much-branched panicles usually 9-10 (-15) cm. long and many-flowered, the peduncles not more than 4.5 cm. long and usually less. The flowers vary in size from 4-6 mm. long, the elliptic or oblong or ovate-

elliptic fleshy papillose lobes rounded or obtuse and up to 5 mm. long. The stamens of the two outer series are \pm 2.8 mm. in length, the ovate acutish or obtuse petaloid anthers borne on exceedingly short stout filaments, the upper third of the anthers being connective tissue. Those of the inner series are longer, \pm 3.2 mm., and the filament is also longer, being about one-third the entire length of the stamen, and bearing two small subsessile glands at the base of the anther. Wherever staminodia have been observed, they are cordate, subsessile, and \pm 0.6 mm. long. The glabrous gynaecium is \pm 2.4 mm. long; the ovary is probably ovoid, there being seemingly no distinct line of demarcation between it and the stout style, which is topped by a usually conspicuous stigma varying from capitate to decurrent. The fruit is ellipsoid, black, \pm 2.3 cm. long and 1.2 cm. broad, borne in a glabrous woody cyathiform cupule that is 1 cm. long, 6 mm. deep, and 14 mm. in diameter, with a shallowly and obscurely lobed and slightly undulate double margin, subtended by a thickish striate pedicel up to 6 mm. long and pubescent to glabrous.

There are differences between the material collected in Mexico and Guatemala and that of Costa Rica. For example, the flowers of specimens collected in the former area are smaller than those of the southern area. The fruits, also, are smaller and the cupules subtending them are shorter. Nevertheless, it seems advisable to combine the two, since the differences are merely of degree.

The nearest relative of the species appears to be the smaller-leaved *O. veraguensis*, which has essentially the same floral structure, the style being more pronounced, the same incipiently double-margined cupule, and blackish petioles contrasting with the grayish angled branchlets and bearing leaf-blades that show no reticulation on their upper surface.

16. *Ocotea veraguensis* (Meissner) Mez in Jahrb. Bot. Gart. Berlin 5: 240. 1889; Standley in Contr. U. S. Nat. Herb. 23: 295. 1922; Standley & Calderón, Lista Prelim. Pl. Salvador 85. 1925; Standley in Field Mus. Publ. Bot. 12: 457. 1937.
Sassafridium veraguense Meissner in DC. Prodr. 15¹: 171. 1864.
Ocotea Bakeri Blake in Contr. Gray Herb. n.s. 52: 65. 1917.
Ocotea escuintlensis Lundell in Contr. Univ. Mich. Herb. 6: 15. 1941.

♂ DISTRIBUTION: General in forests throughout the regions along the Pacific coast (Pacific tierra caliente) from Mexico to Panama, usually at a very low altitude; occasionally found inland at higher altitudes (up to 1200 m.). The wood is used in some localities for construction. Some parts of the tree are used by the natives of Nicaragua as a tonic.

MEXICO: Sinaloa: El Castillo, Mazatlán, *Ortega 6913* (fr., Ch). Nayarit (Tepic): San Blas, *Lamb 611* (fr., GH, NY). Guerrero or Michoacán: Botella, *Langlássé 656* (fl., GH). Guerrero: Mountains around Acapulco, *Gamon 6* (sterile, Y). Chiapas: Tonalá, in undergrowth along the banks of the river, *C. & E. Seler 1886* (fr., GH); near Tapaná and La Junta in the high forest of the river-bed, *C. & E. Seler 1889* (fl., GH, NY); Escuintla, May 3, 1936, *Matuda 654* (fl., type of *O. escuintlensis*, Mich); San Pedro, *Mell 558* (fr., NY). GUATEMALA: Guatemala: Río Ocosito, *J. D. Smith 2608* (fl., fr., GH, NY). Escuintla: Below Las Lajas, common in damp forest, *Standley 64785* (fl., A). EL SALVADOR: Dept. unknown, Cerro del Guayabal, *S. Calderón 1971* (fl., GH). Ahuachapán: Sierra de Apaneca, in forest in the region of Finca Colima, *Standley 20178* (sterile, GH). La Libertad: Comasagua, *S. Calderón 1390* (fr., GH). San Jacinto: Cerro de San Jacinto, *S. Calderón 2258* (fl., fr., GH, NY); in forest near summit of Cerro de San Jacinto, near San

Salvador, *Standley 20638* (fl., GH, NY). San Vicente: In quebrada, vicinity of San Vicente, *Standley 21668* (fl., GH, NY). Usulután: Berlín, *S. Calderón 2146* (fl., GH, NY). NICARAGUA: Without locality, *Wright s.n.* (fr., NY); Prov. unknown, Volcán Mombacho, *Baker 2493* (fl., type of *O. Bakeri*, GH). COSTA RICA: Guanacaste: Roadsides south of Liberia, *Dodge & Thomas 6312* (fl., NY); near Nicoya, *Tondus 13809* (fl., GH), *13845* (fr., GH). Alajuela: Atenas, in the Pacific tropic zone in half-shade on edge of woodland in clay-loam, *A. Smith P.2464* (fl., A). PANAMA: Chiriquí: Vicinity of San Felix, *Pittier 5278* (fl., GH, NY). Veraguas: Near Veraguas, *Bridges* (SYNTYPE of *Sassafridium veraguense* not seen), *Warscewicz* (fl., photo. of SYNTYPE of *Sassafridium veraguense*, Ch, GH). Coclé: Penonome and vicinity, *R. S. Williams 236* (fr., NY). Panama: Río Las Lajas, *P. H. Allen 1611* (fl., fr., GH, Mo, NY).

NATIVE NAMES: "Aguacatillo" (Costa Rica); "Canelillo" (Costa Rica); "Canelito" (El Salvador); "Canelo" (Costa Rica, El Salvador); "Laurel" (Mexico); "Palo colorado" (Nicaragua); "Pimientillo" (El Salvador); "Pimiento" (El Salvador); "Quisarrá" (Costa Rica); "Sigua canelo" (Panama).

This coastal species has branchlets that are finely gray- or tawny-sericeous, very quickly becoming pale gray, glabrous, and striate. The blackish stout canaliculate glabrescent petioles, up to 1 (sometimes to 1.5) cm. long, often make a striking contrast with the smooth grayish branchlets. The blades of the leaves are chartaceous to subcoriaceous, early soft grayish-pubescent below, becoming entirely glabrous, the margin in the dried state usually conspicuously minutely undulate or crisped. The color is uniformly a pale grayish green and the upper surface is very smooth. The blades are variable in shape, being elliptic, lanceolate-elliptic, oblong, oblong-elliptic, and finally rarely obovate, the base obtuse or cuneate, the apex rounded-obtuse or obtusely acute. The costa is very prominent above and beneath, although only slightly elevated above and more conspicuously so beneath. The lateral nerves, of which there are 6 or more obscure pairs, are not visible above and only faintly so beneath. The reticulation is not visible above and is very inconspicuous beneath. The inflorescence is axillary, paniculate, grayish-pubescent to glabrescent, many-flowered, the ultimate branchlets frequently giving the appearance of simulating a head-like formation. The entire length of the panicle varies from 3 to 13 cm., the peduncle sometimes attaining a length of 9 cm. The flowers are pubescent, up to 5 mm. long and more than twice that in diameter at anthesis, are supported by slender pubescent pedicels to 6 mm. long, and show a well developed tube. The lobes are oblong, obtuse or acutish, thick, fleshy, papillose, up to 3 mm. long. The stamens of the two outer series are ± 2.4 mm. long, the petaloid ovate anthers nearly sessile, the protruding papillose connective occupying at least the upper third of the anther. Those of the inner series are often slightly longer than the outer ones, the anthers being subtended by short filaments which bear at the base two conspicuous short-stipitate or sessile glands that are nearly the length of the anthers. The staminodia are variable, being absent or, if present, linear or consisting of a definite stipitate ovate head, always pubescent, from ± 0.6 to ± 0.9 mm. long. The glabrous gynaeceum also varies, sometimes reaching a length of ± 2.15 mm., the ellipsoid to subglobose ovary usually twice the length of the tapering style with its usually conspicuous triangular stigma. The fruit of the species is very poorly represented in collections. It seems to be (immature?) greenish or light brown, not very firm in texture, ellipsoid, apiculate, up to 1.7 cm. long and about 1 cm. broad, subtended by a shallow thinnish cupule about 5 cm. long, 12 mm. in diameter, and about 3-4 mm.

deep. The margin is distinctly double, as in the genus *Licaria* — in fact the species has a superficial resemblance to *L. misantlae*. The outer margin is somewhat thickened and undulate, the inner is plain, paler in color, minutely pubescent, and protrudes beyond the outer for less than 1 mm. The pedicel is up to 1 cm. long, enlarging toward the apex to about 3 mm. in diameter.

The grayish branchlets, the blackish petioles, and the smooth gray-green leaf-blades recall to mind the larger-leaved species *O. Dendrodaphne*. The floral structure is of the same type, and the fruits are subtended by double-margined cupules. The consistently extremely large leaves of *O. Dendrodaphne*, however, preclude the possibility of its being a variety of the more widely spread *O. veraguense*.

Meissner cites as syntype *Oersted 10*, which is a *Litsea*, but Mez cites *Oersted 12* and *13*, from Costa Rica. I have seen neither of these syntypes. Most of the specimens from El Salvador show larger stamens, ± 1.25 mm. in length, and frequently these are equipped with glands similar to those of the stamens of the third or inner series. Occasionally a specimen (i.e., *A. Smith P.2464*) will have flower-parts that are extra large throughout.

17. *Ocotea chiapensis* (Lundell) Standley & Steyermark in Field Mus. Publ. Bot. 23: 114. 1944.

Nectandra chiapensis Lundell in Contr. Univ. Mich. Herb. 6: 12. 1941.

DISTRIBUTION: Known only from type-locality and vicinity in Mexico and from adjacent Guatemala.

MEXICO: Chiapas: At Cerro Laguna, Mapastepec, January, 1938, *Matuda 2042* (fl., ISOTYPE, A, Ch, NY); Rodeo, near Siltepec, *Matuda 4579* (fl., A). GUATEMALA: San Marcos: Along river, between La Vega ridge along Río Vega and northeastern slopes of Volcán Tacaná, to 3 miles from Guatemala-Mexico boundary, in vicinity of San Rafael, *Steyermark 36195* (fl., Ch).

This species has stout cicatricose branchlets that are angled at first and brownish-sericeous, becoming glabrescent and eventually grayish brown. The leaves are supported by pubescent apparent petioles up to 2 and sometimes 3 cm. long, formed by the decurrent blades which are strongly recurved. The blades themselves are early membranaceous, becoming heavily chartaceous, at first densely sericeous, very soon glabrous except for the lower leaf-surface and the exceedingly conspicuous ellipsoid pubescent glands that occur in nearly all of the axils of the lateral nerves. The blades are usually obovate-elliptic, occasionally oblong-elliptic, up to 15 cm. long and 7.5 cm. broad, the base (not including the decurrent petiole) rounded or cuneate, the apex acutish or subacuminate. The broad costa is only slightly elevated above and conspicuously so beneath. The tenuous lateral nerves, of which there are 9–12 pairs, are faintly outlined above but slightly elevated beneath. The reticulation is obscure above and slightly prominent beneath. The inflorescence is axillary, often few-flowered, brownish-sericeous, up to 15 cm. long, the stout pedicel attaining a length of 5 cm. The flowers are ± 3.5 mm. long and about 6 mm. in diameter, the pedicel ± 1.7 mm. long, the subequal thick ovate acutish papillose lobes reflexed and ± 2.15 mm. long. The stamens of the two outer series are about 1.25 mm. long, the elliptic rounded anthers twice the length of the filaments. Those of the third series are ± 1.5 mm. long, the oblong rounded anthers slightly pubescent at the base and only slightly longer than the

filaments that bear conspicuous basal glands. The staminodia are pubescent, ± 0.6 mm. long, either stipe-like or occasionally ovate. The glabrous gynaecium measures ± 2.15 mm., the ellipsoid ovary slightly longer than the slender style topped by a conspicuous peltate stigma.

The species probably belongs near *O. Austinii*, but may be separated by the smaller less robust and less pubescent inflorescence and the more prominent reticulation of the leaf-blades, as well as by the presence of very large conspicuous axillary glands.

18. *Ocotea Austinii*, sp. nov.

Arbor 10–18 m. alta, ramulis striatis, juventute minute brunneo-sericeo-pubescentibus mox griseo- vel atrato-pubescentibus deinde glabrescentibus. Folia alternata, subverticillata, juventute supra glabra, margine et costa exceptis subtus dense et crasse ferrugineo-sericeo-pubescentia, petiolis alatis crassis pubescentibus, 1.5 (–2.5) cm. longis et 4–5 mm. latis, laminis coriaceis in sicco supra brunneis vel viridescenti-brunneis nitidis subtus ferrugineis, opacis, oblongo-ellipticis vel ellipticis vel leviter obovato-ellipticis, 7.5–9 (–11) cm. longis et 3–4.5 cm. latis, basi cuneatis in petiolum decurrentibus ibique valde recurvatis, apice obtusis vel leviter et obtuse subacuminatis, penninerviis, costa supra satis subtus conspicue elevata, utrinque pubescente, nervis 7–10 paribus supra aequae et regulariter leviter elevatis concoloribus, subtus pubescentibus obscuris angulo 45° divergentibus, interdum glandulis obscuris in nervorum lateralium axibus, rete venularum supra aequae et regulariter elevato subcancellato. Inflorescentia axillaris anguste paniculata, subcapitata, pauciflora, robusta, dense sericeo-ferrugineo-pubescentia, ad 8 cm. longa et ad 2 cm. lata, longipedunculata, pedunculis 3–5 cm. longis. Flores ± 2.5 mm. longi, sessiles vel pedicellati, pedicellis ± 2.5 mm. longis, perianthio campanulato (urceolato-campanulato, fide coll.), sulfureo-flavescente, fide coll. (vel viridescenti-flavescente), lobis late ovatis acutis crassis, dense pubescentibus, 3 mm. longis; staminibus ser. I & II ± 1.9 mm. longis, antheris filamentis aequalibus, ser. III ± 2.15 mm. longis, antheris filamentis aequalibus, conspicue biglandulosis, glandulis sessilibus, antheras aequantibus; staminodiis nullis; gynaecio glabro, ± 2.5 mm. longo, ovario subgloboso vel obovoideo, longitudine ultra $\frac{1}{2}$ gynaecii aequante, stigmate triangulari, conspicuo. Fructus late obovoideus atro-olivaceus, minute canescenti- vel griseo-canescenti-punctatus, fide coll. 28×20 mm., cupula vadosa rubra subcampanulata vel maturitate interdum infundifuliformi, nonnihil verruculosa glabra vel glabrescente rugosula, 6–7 cm. longa et ad 1.5 cm. lata, ± 3 mm. diam. subtentus, pedicello glabro rugosulo aciculato ± 1 cm. longo.

DISTRIBUTION: In cloud-forests or cleared pasture-land of Costa Rica and in rain- and cloud-forests of the adjacent areas of Panama, at an altitude of 1765 to 2300 m. in Costa Rica and at 1980 m. in Panama. The wood is used for lumber in Panama.

COSTA RICA: Alajuela: Alfaro Ruiz, Palmira, region of Zarcero, in rich clay-loam and semi-shade, alt. 1765 m., August 14, 1935, *Austin Smith A.125* (fl., TYPE, Ch) (forest tree 15 m., base 1 m; bark light brown, roughened, cambium-layer rufous-brown, sapwood cream-colored; leaves coriaceous, polished on upper surface, lighter green below; flowers sulphur-yellow, with an expanse of 4 mm., urceolate-bell-shaped, stigma and anthers green, maturing to dark brown), *A. Smith A.504* (fl., Ch), *H.1181* (fl., Ch). San José: Near Camp Empalme in oak cloud-forest, along the w. slope of the Continental Divide, about 29 km. S. of Cartago, *Little 6007* (F.S.95042) (fr., A). PANAMA: Chiriquí: In rain-forest, Bajo Chorro, Boquete, *Davidson 268* (fr., A, Ch, Mo); cloud-forest, Cerro Horqueta, *C. & V. W. von Hagen 2128* (fr., A, Mo).

NATIVE NAME: "Sigua Canela" (Panama).

The exceedingly prominent and regular more or less cancellate reticulation of the leaf-blades of this species separate it from the related species *O. Endresiana*, *O. Tonduzii*, and *O. Skutchii*. The blades also differ in the sericeous pubescence and succeeding glaucescent aspect of the lower surface.

19. *Ocotea Endresiana* Mez in Jahrb. Bot. Gart. Berlin 5: 257. 1889; Standley in Field Mus. Publ. Bot. 18: 455. 1937.

DISTRIBUTION: Known only from Costa Rica.

COSTA RICA: Without locality, *Endres* 223 (fl., TYPE not seen). Alajuela: La Palma de San Ramón, *Brenes* 6317 (fl., Ch); Los Angeles de San Ramón, *Brenes* 16227 (fl., Ch); Piedades Sur (La Palma) de San Ramón, *Brenes* 17172 (fr., Ch).

NATIVE NAME: "Maranón" (Costa Rica).

A species that is very difficult to separate, without dissection of the flower, from *Aiouea*. The stout cicatricose branchlets are dark brown, glabrous, and subterete. The leaves are sessile, the blade narrowing about 2-3 cm. above the base and becoming strongly recurved, forming a broad apparent petiole the same length and 5-6 mm. broad. The blades are coriaceous, glabrous throughout except for axillary pubescent glands below, obovate, obtuse or rounded for the most part, up to 12 cm. long and 5.5 cm. broad. The broad costa and the slender lateral nerves, of which there are 6-9 pairs diverging at an angle 35-45°, are obscure above and more prominent, particularly the costa, beneath. The reticulation is very obscure above and conspicuously prominent beneath. The stout inflorescence is axillary or subterminal, glabrous, rather many-flowered, paniculate, 5 (-14) cm. long, the peduncle 2-3 (-6) cm. long. The flowers are \pm 2.5 mm. long, glabrous, supported on slender pedicels 2 (-4) mm. long. The ovate acute lobes are fleshy and up to \pm 2.5 mm. long. The stamens of the two outer series are up to \pm 1.25 mm. long, the ovate roundish anthers only slightly longer than the somewhat stout filaments. Those of the inner series are \pm 1.7 mm. long, the more narrowly ovate anthers surpassed slightly by the filaments which bear two large subglobose sessile glands at the base. The glabrous gynaecium is \pm 2.4 mm. long, the ellipsoid ovary only slightly exceeding the stout style in length, the whole topped by a discoid inconspicuous stigma. (Mez describes the ovary of the type-specimen as being subglobose and one-half again longer than the almost slender erect style with discoid-obtuse stigma.) The fruit (that of *Brenes* 17172, the vegetative characters of which match Mez' description of *O. Endresiana*) is ellipsoid, apiculate (immature?), up to 1 cm. long and 7 mm. broad, and is borne in a shallow woody cupule with an entire margin, 3-5 mm. long and about 5-6 mm. in diameter and not more than 1 mm. deep; the thickened pedicel is not more than 2 mm. or so long and 3-4 mm. in diameter at the apex.

The species is separated from *O. Tonduzii* by the very broad decurrent and recurved sessile blades, forming a much longer apparent petiole, and in fruit by the entire cupule.

20. *Ocotea Tonduzii* Standley in Field Mus. Publ. Bot. 18: 456. 1937.

Ocotea cuneata Mez in Jahrb. Bot. 30: Beibl. 67: 17. 1901, non Gomez, 1894.

DISTRIBUTION: Costa Rica, in forests from 640 to 1200 m. altitude.

NATIVE NAME: "Ira" (Costa Rica).

COSTA RICA: Province unknown, near Rancho Flores, *Tonduz* 2142 (fl., SYNTYPE of

O. cuneata not seen). Heredia: On banks of the Río Segundo, alt. 2000 m., *Tonduz* (Herb. Inst. Costa Rica) 1739 (fl., SYNTYPE of *Ocotea cuneata* not seen). San José: Vicinity of El General, *Skutch* 4303 (fr., A, Ch, NY). Cartago: Forests of Quebrada Honda, near Juan Viñas (Atlantic), *Tonduz* 10415 (fr., isosyntype of *O. Ira*, US).

The fruiting material above matches very well with the description given by Standley. It is with little hesitation that the numbers are placed here. The branchlets are glabrous, grayish, almost checkered, very thick, and angled toward the tips. The leaves are subsessile, the base of the blade decurrent and strongly recurved, making an apparent petiole up to 2.5 cm. long. The coriaceous glabrous blades are opaque, obovate, attenuately cuneate at the base and rounded or very inconspicuously and shortly acuminate at the apex. They measure up to 15 cm. long and 7 cm. broad (those of *Tonduz* 10415 are much smaller). The costa is impressed above but prominent beneath. The lateral nerves, of which there are upwards of 8 pairs, are delicately elevated above and more prominently so beneath. The reticulation is obscure throughout. The inflorescence, according to Mez, is stoutly scopiform-paniculate, the pedicels 0.5–1.5 mm. long, the bracteoles deciduous. The flowers are 2.5–3.5 mm. long, the perianth-tube barely distinct from the pedicel and gradually merging into it. The lobes are broadly ovate, rotund or acutish. The filaments are glabrous and those of the inner series have two large glands at the base, irregularly and incised-lobed. The ovary is subglobose and the stigma discoid. The ellipsoid fruits are 1.5 cm. long and 8 mm. broad, borne in woody cyathiform red cupules still crowned with the remnants of the perianth-lobes, 4–6 mm. long, about 8 mm. in diameter, and about 4 mm. deep. The pedicel is very short, not more than 2 mm. long and expanded to the same width at the apex.

Ocotea Tonduzii is very close to *O. Endresiana*, but may be separated from the latter by the very short petiole, narrowly decurrent blades, the 6-lobed cupule, and the pubescent axillary glands. The fruiting material of this species is often confused with that of *Aniba*, and it is very difficult to enumerate the points of difference.

The confusion of numbers cited by Mez under *O. Ira* is taken up under that species.

21. *Ocotea Skutchii*, sp. nov.

Arbor ad 27 m. alta, ramulis brunneis angulatis mox griseis sulcatis. Folia alternata, juventute fulvo-sericeo-pubescentia mox glabrescentia vel glabra, petiolis conspicue alatis, alis recurvatis. inconspicue pilosis vel glabris, ad 2.5 cm. longis et basi 2 mm. apice ad 8 mm. latis, laminis supra glabris, subtus sparse et inconspicue pubescentibus, satis coriaceis, in sicco supra viridescentibus subtus pallidioribus vel subglaucescentibus, ellipticis vel leviter obovato-ellipticis, 10.5 (–13) cm. longis et 4–4.5 (–5.5) cm. latis, basi cuneatis, in petiolum decurrentibus ibique valde recurvatis, apice abrupte obtuse acuminatis, penninerviis, costa supra haud impressa subtus valde elevata, costa nervisque utrinque conspicue flavescentibus vel albescentibus, interdum costa subtus rubescente, nervis 8 vel 9 paribus supra leviter impressis subtus elevatis, angulo 45° divergentibus, interdum glandulis obscuris in nervorum lateralium axibus; rete venularum supra haud subtus satis prominulo. Inflorescentia axillaris, late et laxè paniculata, ad 16 cm. longa, pubescens, pedunculo ad 6 cm. longo. Flores

2.5–3 mm. longi, pedicellis ad 5 mm. longis, gracilibus, perianthio campanulato, flavescente fide coll., lobis late ovatis, crassis, ± 1.7 mm. longis; staminibus ser. I & II ± 1 mm. longis antheris ovatis rotundatis filamentis duplo longioribus, ser. III ± 1.5 mm. longis conspicue biglandulosis, glandulis subglobosis stipitatis; staminodiis nullis; gynaecio glabro ± 1.8 mm. longo ovario ellipsoideo stylo gracili duplo longiore, stigmatibus parvisimo inconspicuo. Fructus non visus viridis, fide coll., cupula rubra vadosa leviter campanulata minute verruculosa crassa glabra ad 1 cm. longa, 9 mm. diam., 3 mm. alta subtentus, pedicello glabro, striato, ad 7 mm. longo.

DISTRIBUTION: Known only from Costa Rica, at 700–1680 m. altitude.

COSTA RICA: Heredia(?): Vicinity of Vara Blanca, north slope of Central Cordillera, between Poás and Barba volcanoes, *Skutch* 3755 (fr., A, NY). San José: Vicinity of El General, alt. 700 m., Dec. 1936, *Skutch* 3062 (fl., TYPE — GH, NY) (tree 27 m.; flowers yellowish).

NATIVE NAME: "Ira rosa" (Costa Rica).

This species may be separated from *O. Tonduzii* and *O. Endresiana* by a combination of characters, such as the short petiolate leaves with the blades only narrowly decurrent on the petioles, the apparent petiole up to 2.5 mm. long, axillary glands either absent or if present conspicuous for being narrowly ellipsoid, and the entire cupule.

22. *Ocotea rubrinervis* Mez in Jahrb. Bot. Gart. Berlin 5: 351. 1889.

DISTRIBUTION: Panama, and south to Peru and Bolivia; probably occurring in the intervening areas. Not mentioned by Kostermans in Pulle's Flora of Surinam.

PANAMA: Without locality, *Duchassaing* (SYNTYPE not seen). San José Island, Perlas archipelago, Gulf of Panama (about 55 miles SSE. of Balboa), in mixed forest along South Road (S² area), *Johnston* 111, 133, 250, 415, 497 (fl., A), 556, 563, 604, 655 (fr., A). [PERU: San Martín: Near Tarapoto, *Spruce* 4580 (photo. of SYNTYPE, GH).]

The species is described as having young branchlets pilose at the apex, the adult ones glabrous, cinereous, terete. The branchlets of the Johnston specimens are densely dark brown-pubescent, becoming glabrous and at length cinereous. The short canaliculate petioles are also pubescent, becoming glabrescent, and measure to 1 cm. long as opposed to Mez' description. The blades of Mez' description are foveolate and glabrous above, pilose beneath. Those of Johnston's collections are scattered-pubescent near the base, rather reticulate above, glabrescent beneath except for the pubescent axillary glands. The blades are elliptic or broadly elliptic, the base subrounded, obtuse or cuneate, the apex shortly obtusely acuminate or obtusely acute, measuring to 11 cm. long and up to 7 cm. in breadth, larger on the whole than the specimens of Mez' description. The costa and lateral nerves, of which there are 4–6 pairs, are impressed above and prominently elevated and yellowish beneath. The inflorescence is axillary or subterminal, slender, the branches of the panicle narrowly racemose, glabrescent for the most part, the flowers grayish-pubescent rather than ferruginous-pilose. The staminate flowers are yellow, about 3 mm. or less long, and sessile or borne on a short pedicel less than 1 mm. long. The ovate acutish lobes are rather thick and ± 2.15 mm. long. The stamens of the two outer series are ± 1.5 mm. long, the ovate obtuse to roundish anthers slightly longer than the filaments. Those of the inner series are slightly larger and have anthers more narrowly ovate, supported by filaments com-

pletely covered on the dorsal side by the conspicuous fused sessile glands borne at the base. The slender transparent staminodia, less than one-half a millimeter in length, are oblanceolate. Mez says that all staminodia are aborted in his material. The aborted glabrous gynaecium is ± 1.9 mm. long, subcylindrical, the basal part bulging only slightly, and the apex bearing a conspicuous (triangular according to Mez) stigma depressed above.

Although there are discrepancies and Johnston's material does not precisely match the description of Mez' species, the two are so close that it seems unwise, at least until the types are available, to describe Johnston's collections as new.

23. *Ocotea subsericea* Standley in Field Mus. Publ. Bot. 18: 456. 1937.

DISTRIBUTION: Costa Rica and Panama, at an altitude of about 1250 m.

COSTA RICA: Alajuela: La Palma de San Ramón, 1250 m. alt., March 30, 1929, Brenes 6789 (665) (fl., Ch, TYPE). PANAMA: Coclé: North rim of El Valle, P. H. Allen 1907 (fr., Ch, GH, Mo, NY).

This species was described from a specimen which seemingly is not only from a branch that is very young, but growing in an unexposed situation. The branchlets are minutely but densely appressed-yellowish-buff-sericeous-tomentose, angled, becoming grayish, glabrous, terete, and striate-sulcate. The petioles of the leaves are also pubescent, slender, subcanaliculate, and up to 1.5 cm. long. The blades of the type are thinly membranaceous, those of the adult leaves more thickly membranaceous, elliptic, the base cuneate, the apex abruptly and obtusely acuminate, up to 12 cm. long and 4.5 cm. broad. The costa is minutely elevated above and conspicuously so beneath. The lateral nerves, of which there are 6-8 pairs, diverge at an angle of about 45° , and bear more or less inconspicuous axillary glands. The inflorescence is axillary, paniculate, rather few-flowered, densely but closely pubescent, up to 6.5 cm. long, the glabrescent flowers up to 3 mm. long, spreading-campanulate, the pedicel 2-4 mm. long. The ovate acutish lobes are fleshy and papillose within, ± 2.15 mm. long. The stamens of the two outer series are ± 1.25 mm. long, and the anthers are ovate, truncate, almost equalled by the stout filaments. Those of the inner series are oblong, the filaments covered with conspicuous sessile glands. The slender (undeveloped, or maybe this is the staminate flower of a dioecious species) glabrous gynaecium is ± 2.15 mm. long, the narrow ovary blending imperceptibly into the stout style that bears a conspicuous peltate stigma. The fruit is pointedly ovoid, black, up to 2.5 cm. long and 1.5 cm. broad near the base, supported by a flat almost disk-like woody cupule separated from the fleshy fruit, at least on drying, about 1.5 cm. in diameter and slightly undulate. The enlarged pedicel (as well as the cupule) is pale brownish-buff, deeply furrowed and verruculose, measuring up to 1 cm. in length and 5 mm. in diameter throughout.

The relationship of the species to *O. eucuneata* is discussed under that species.

24. *Ocotea Klotzschiana* (Nees) Hemsley, Biol. Centr. Am. Bot. 3: 73. 1882; Mez in Jahrb. Bot. Gart. Berlin 5: 273. 1889.

Oreodaphne Klotzschiana Nees in Linnaea 21: 523. 1848.

DISTRIBUTION: Known only from Mexico.

MEXICO: State unknown, "Bei El Banco," Ehrenberg 943 (fl., fragm. of TYPE, Ch); Hartweg 383 (fl., cited by Mez, photo., Ch).

This entity (a tree according to Ehrenberg; a shrub 2-3 m. high according to Hartweg) has terete branchlets that are sparsely pilose near the apex, quickly becoming glabrous and black-brown. The petioles are up to 15 mm. long and canaliculate. From the fragment the blades appear to be oblong-elliptic (or in the photo. lanceolate or elliptic-lanceolate), the base cuneate, the apex acuminate (long-acuminate in the photo.). They are chartaceous, shining above, and everywhere very prominently and coarsely reticulate, measuring up to 9 cm. long and 2.8 cm. broad. The costa is conspicuous though not elevated above, and very prominent beneath. The lateral nerves are obscured by the prominent reticulation but appear to number 4-6 pairs, diverging at an angle between 30° and 50° and bearing beneath conspicuous axillary pubescent glands. The axillary panicleate many-flowered inflorescence, up to 5 cm. long, is described as pubescent, and the peduncle is 1 cm. or less in length. The flowers are about 2.5 mm. long and pubescent, the slender pubescent pedicel not more than 2-3 mm. long. The thinnish ovate acutish lobes are \pm 2.15 mm. long. The stamens of the two outer series are \pm 1 mm. long, the anthers are almost rectangular-ovate and twice the length of the filaments. Those of the inner series are \pm 1.7 mm. long, the almost equal filaments bearing conspicuous ovate glands that are stipitate and almost the length of the filaments. The staminodia are linear, acuminate, pubescent, \pm 0.6 mm. long. The glabrous gynaeceum is \pm 2.25 mm. long, the subglobose-ovoid ovary topped by a slender style of equal length which flares into a discoid very conspicuous stigma. The fruit is unknown at present.

This little collected and little known species is one of the smallest-leaved species found in this area, sharing this character with *O. effusa*, from southern Mexico, adjacent Guatemala, and British Honduras. In addition it is outstanding because of its shining prominently reticulate leaf-blades, which are chartaceous.

25. *Ocotea effusa* (Meissner) Hemsley, Biol. Centr. Am. Bot. 3: 73. 1882; Standley in Contr. U. S. Nat. Herb. 23: 296. 1922; Lundell in Contr. Univ. Mich. Herb. 6: 15. 1941.

Oreodaphne effusa Meissner in DC. Prodr. 151: 120. 1864.

DISTRIBUTION: Southern Mexico, Guatemala, and British Honduras, in forests.

MEXICO: Oaxaca: Near San Pedro Nolasco, Talea, etc., 1843-44, Juergensen 906 (fl., fragm. of TYPE, Ch, photo., Ch, NY). (Probably Oaxaca): Monte Mistan, 184-, Galeotti s.n. (fl., Ch, GH, US). Chiapas: Damp forest, mountains east of Fenix, Purpus 10309 (fl., NY), 10690 (fl., GH). GUATEMALA: Huehuetenango: Between Ixcán and Río Ixcán, Sierra de los Cuchumatanes, Steyermark 49373 (fr., Ch). BRITISH HONDURAS: Stann Creek: In high ridge on hillside, Middlesex, Gentle 2926 (fr., A, NY); Mountain Cow Ridge, Gentle 3266 (fl., A, NY).

This slender dainty-leaved species has slender terete obscurely striate branchlets that are early sericeous but quickly lose their pubescence, becoming glabrous almost at once. The petioles are delicate, canaliculate, and glabrous, measuring up to 5 mm. and occasionally almost approaching a centimeter in length. The thinly membranaceous almost shining blades are glabrous throughout except for the costa beneath, the base lanceolate and attenuately cuneate, the apex attenuately and obtusely caudate-acuminate. The costa is slightly but conspicuously elevated above and beneath.

The numerous pairs of lateral nerves are so obscure that it is difficult to count them. The reticulation is not visible above and although present beneath is very obscure. The tenuous weak inflorescence is axillary or subterminal, paniculate, glabrous, few-flowered, up to about 12 cm. long, and the peduncle is up to 5.5 cm. The tenuous flowers are about 3 mm. long subtended by filamentous pedicels that are sometimes as long as 5 mm. The perianth-tube is well developed, and the ovate acutish lobes are thin in texture, ± 1.7 mm. long. The stamens of the two outer series are ± 1.25 mm. long, the rectangular-ovate roundish anthers nearly twice the length of the slender sometimes pubescent filaments. Those of the inner series are ± 1.7 mm. long, the anthers more slender, and with the subequal filaments bearing two distinct subglobose sessile glands at the base. The staminodia are linear, pubescent, and ± 0.7 mm. long. The glabrous gynaeceum is ± 1.7 mm. long, the ellipsoid-subglobose ovary about equalling the attenuate style bearing a subcapitate obtuse stigma. The fruit is ellipsoid, apiculate, up to 14 mm. long and 9 mm. broad, subtended by a shallow flaring cupule up to 4 mm. long, 6 mm. in diameter, and not more than 1.5 mm. deep, the margin only slightly undulate. The pedicel is almost 1 cm. long, expanded at the apex to 4 mm. in diameter.

The slender aspect of the inflorescence and the dainty thread-like pedicels of the small flowers of this species separate it immediately from the only other near relative, *O. Klotzschiana*. Also the leaf-blades, with prominent costa above and the reticulation very obscure, are in contrast to the conspicuous reticulation of *O. Klotzschiana* throughout.

26. *Ocotea Bernoulliana* Mez in Jahrb. Bot. Gart. Berlin 5: 275. 1889.

DISTRIBUTION: Guatemala, Honduras, and British Honduras, up to 2000 m. altitude.

GUATEMALA: Huehuetenango: Cerro Chiblac, between Finca Rafael and Ixcán, Sierra de los Cuchumatanes, *Steyermark* 49181 (fr., Ch). Alta Verapaz: Damp forest, region of Chelac, northeast of Carchá, *Standley* 70367 (fl., Ch), 70523 (fl., Ch). Quezaltenango?: Near Mujulia (Majulia), *Bernoulli & Cario* 2590 (fl., fr., TYPE not seen). HONDURAS: Yoro: Near Progreso, Farm 42, *Hottle* 83 (fl., Ch); *C. & V. W. von Hagen* 1118 (fr., Ch, NY). Atlántida: Lancetilla Valley, near Tela, *Standley* 56721 (fl., Ch). BRITISH HONDURAS: Orange Walk: Roaring Creek, *Lundell* 325, 370 (fr., Ch). Stann Creek: In high ridge on hillside, Big Eddy Ridge, *Gentle* 3351 (fr., A, NY); Middlesex, along river-bank, *Schipp* 399 (fr., GH, NY). Toledo: Eldorado, *Schipp* 398 (fr., Ch); Silkgrass Reserve, Hope Creek Road, $\frac{1}{2}$ m. n. Silkgrass Camp, *Stevenson* 167 (fr., Ch).

NATIVE NAMES: "Aguacatillo" (Honduras); "Canoj" (Guatemala); "Laurel," "Timbersweet" (British Honduras).

The present species has dark reddish brown glabrous branchlets that are rather slender and striate. The slight petioles are dark, canaliculate, and glabrous, measuring up to 1.5 cm. long. The blades are membranaceous, rarely subcoriaceous, glabrous, usually oblong-elliptic, the base narrowly cuneate or occasionally roundish and abruptly cuneate at the very base, the apex usually caudate-acuminate, 13 (–18) cm. long and 5 (–7) cm. broad. The costa is slightly elevated above and conspicuous, more prominently so beneath. The slender lateral nerves, of which there are 4–6 (–8 rarely) pairs, are slightly elevated above, more conspicuously so beneath, the upper pairs diverging at an angle of 25–35°, the lower about 45°. The minute and regular reticulation, although very obvious above, is much more conspicuous beneath. The inflorescence is glabrous, axillary, consist-

ing of usually not more than one (occasionally three) few-flowered panicles, not more than 10 cm., borne on long slender peduncles not more than 6.5 cm. long. The small flowers are perfect, glabrous, and up to 3 mm. long according to Mez (the ones at hand, being in bud, do not measure more than 2.15 mm.). The perianth-tube is conspicuous, the thickish lobes elliptic or ovate, \pm 2.15 mm. long. The stamens of the two outer series are \pm 1 mm. long, with long ovate obtuse nearly sessile anthers. Those of the inner series are \pm 1.25 mm. long, with rectangular or square anthers borne on short filaments about one-half their length and having at the base two short-stipitate cordate glands equalling the filaments in length. The staminodia, when present, are attenuately linear and pubescent, \pm 0.6 mm. long. The glabrous gynaecium is \pm 1.7 mm. long, the globose ovary equalling the rather sturdy style topped by a triangular-peltate stigma. The fruit is practically identical with that of the preceding species, which see for a discussion of relationships.

27. *Ocotea tenera* Mez & J. D. Smith ex Mez in Bull. Herb. Boiss. II. 3: 234. 1903; Standley in Field Mus. Publ. Bot. 18: 456. 1937.

DISTRIBUTION: Known only from Costa Rica, for the most part from the Atlantic tierra caliente, at 200 m. altitude along the coast to 1250 m. inland.

COSTA RICA: Alajuela: Region of Zarcero, in shade on humid hill-slope of Pacific cloud-forest, *A. Smith* 159 (fl., Ch), *A.228* (φ fl., A, Ch); San Pedro de San Ramón, *Brenes* 3617 (153), 4200 (212) (fr., Ch), 4439 (224) (φ fl., Ch). Limón: Forest of Shiroes, Talamanca, *Pittier & Tonduz* 9184 (fr., ISOSYNTYPE, US); along Banana River (Bananita), near Port Limón, *Pittier* 3633 (φ fl., Ch); Llanuras de Santa Clara in the plantations at La Colombiana, *Pittier* 7607 (Herb. Nat. Costa Rica 13396) (φ fl., ISOSYNTYPE, Ch, US). Cartago: Turrialba, alt. 570 m., June, 1895, *Tonduz* 8330 (SYNTYPE not seen).

NATIVE NAMES: "Aguacatillo," "Quisarrá lantisco" (lentisco?) (Costa Rica).

This species, also belonging in the *O. cernua* complex, has dark glabrous branchlets that on the whole seem to be somewhat stouter than those of *O. cernua*. The petioles are dark, slender, canaliculate and glabrous, up to 1 cm. in length. The membranaceous blades are elliptic-oblong or occasionally elliptic, the base cuneate or broadly so (occasionally obtuse or roundish), the apex caudate-acuminate, up to 16 cm. long and usually not more than 5 cm. broad. The broad costa and slender lateral nerves, of which there are usually 6 (-8) pairs diverging arcuately at an angle of about 45° , are obscure above and elevated beneath. The delicate reticulation is also rather obscure above and prominent beneath. The inflorescence is axillary, slender, glabrous, paniculate, usually less than 8 cm. long, occasionally to 12 cm., the slender peduncle usually not more than 2 cm. long, occasionally to 4 cm. The flowers, seemingly φ , are glabrous, up to 3 mm. long, the tube fairly conspicuous, the lobes ovate or broadly ovate, acutish, and \pm 1.7 mm. long, thinnish or occasionally thick. The staminodia of the two outer series are \pm 1 (-2.15) mm. long and usually show poorly developed anthers, as do those of the third series, which have small ovate sessile basal glands. The filaments are usually very broad and as long as if not longer than the anthers. The staminodia of the fourth series, when present, are scale-like and lanceolate. The glabrous gynaecium is \pm 1.7 mm. long, the ellipsoid ovary narrowing gradually into the tapering style that is only about half its length and topped by a conspicuous subcapitate stigma. The fruit is 2.5 cm. long and about 1.3 cm. broad, shining-

black and glabrous, subtended by a flat flaring disk-like undulate-margined cupule not more than 3 mm. long and 1 cm. in diameter, the pedicel seemingly up to 1.5 cm. long and expanded to 5 mm. at its apex.

There is a discrepancy between the description of Mez and the specimens cited here. Also, some of the Costa Rican sheets seem to show flowers that appear almost perfect. It is possible that examination of the type in connection with the types of the other two species of this group, namely *O. cernua* and *O. Bernoulliana*, may clarify the delimitation of the flowering phase of these three entities. Certainly the fruit of *O. tenera* is distinct from that of the other two species.

28. *Ocotea cernua* (Nees) Mez in Jahrb. Bot. Gart. Berlin 5: 377. 1889; Standley in Contr. U. S. Nat. Herb. 23: 295. 1922, in op. cit. 27: 183. 1928, in Trop. Woods 21: 17. 1930, in Field Mus. Publ. Bot. 10: 201. 1931; Standley & Record in Field Mus. Publ. Bot. 12: 143. 1936; Standley in op. cit. 18: 454. 1937; Yuncker in op. cit. 9: 290. 1940.

Oreodaphne cernua Nees, Syst. Laurin. 424. 1836.

Oreodaphne Sieberi Meissner in DC. Prodr. 15¹: 137. 1864, at least in part.

Ocotea Sieberi Hemsley, Biol. Centr. Am. Bot. 3: 73. 1882.

DISTRIBUTION: Southern Mexico, Central America, and West Indies, and, according to Meissner, in South America.

MEXICO: Vera Cruz: Fortuña, Coatzacoalcas River, *L. Williams* 8441 (♂ fl., A, Ch), 8953 (♂ fl., A, Ch, NY). Tabasco: Teapa, alt. 90 m., May, 1840, *Linden* 1601 (♀ fl., fragm. of syntype of *Oreodaphne Sieberi*, NY), 1607 (syntype of *Oreodaphne Sieberi* not seen). GUATEMALA: Without locality (eastern portions of Verapaz and Chiquimula), *Watson* 450 (♂ fl., GH). HONDURAS: Atlántida: In open forest, foothills near the Cangrejal River, *Yuncker, Koepper & Wagner* 8788 (fr., Ch, NY). BRITISH HONDURAS: Stann Creek: On hillside, Stann Creek Valley, 15 miles, *Gentle* 2120 (fr., A, NY); in high ridge, Middlesex, *Gentle* 2767 (♂ fl., A, NY); Big Eddy Ridge, *Gentle* 3310 (♂ fl., A, NY); Stann Creek Railway, 15 mile, *Schipp* 161 (♂ fl., Ch, GH, NY). COSTA RICA: Puntarenas: Playa Blanca, Golfo Dulce, *Valerio* 397 (♂ fl., Ch). Alajuela: Guadalupe de Zarcero, *A. Smith* A.556 (♂ fl., A). San José: Forests of Las Vueltas, Toucurrique, *Tondus* 13366 (♂ fl., GH, NY); vicinity of El General, *Skutch* 4270 (♂ fl., A, NY), 4738 (♂ fl., A, Ch). Cartago: Tuis, near Turrialba, *Pittier* 11251 (♂ fl., GH). PANAMA: Bocas del Toro: Changuinola Valley, *Cooper & Slater* 105 (Y 10286) (♂ fl., Ch, GH, NY); Island Potrero, *Dunlap* 568 (♂ fl., Ch, GH); Water Valley, *von Wedel* 803 (fr., GH, Mo). Chiriquí: Without locality, *Cooper & Slater* 262 (Y 10615) (fr., Y). Canal Zone: Barro Colorado Island, Shannon Trail, *Shattuck* 535 (fr., Ch), Drayton Point, *Shattuck* 1140 (fr., Ch); shore of cove s. from Lock site, *Woodworth & Vestal* 471 (♂ fl., A, Ch). Darién: Along the Sambú River, above tide-limit, *Pittier* 5692 (♂ fl., Ch).

NATIVE NAMES: "Aguacatillo" (Mexico, Honduras, British Honduras); "Laurel" (Tabasco); "Laureo de bajo" (Campeche); "Sigua," "Sigua amarillo" (Panama); "Timbersweet" (British Honduras).

This species has branchlets which are early pubescent but quickly glabrous, angled or striate, terete. The petioles of the leaves are slender, canaliculate, glabrous, up to 12 mm. long. The blades are chartaceous or subcoriaceous, glabrous throughout, usually oblong-elliptic, the base, generally speaking, roundish or obtuse with the extreme portion abruptly cuneate, the apex abruptly or gradually acuminate, usually caudate-acuminate. They measure up to 16 cm. long and 6.5 cm. broad. The costa is conspicuous above, although not as prominently elevated as beneath. The

delicately etched lateral nerves, of which there are 4-6 pairs, are obscure above but more prominent beneath, the lowermost pairs usually being the longest. The lowermost pairs diverge at an angle of about 25-35° from the costa, and the upper at an angle of about 45°. The reticulation is obscure above and less so beneath. The inflorescence consists of numerous many-flowered branching axillary glabrous panicles bearing small flowers. The glabrous ♂ flowers are yellowish, very small, not more than 2 mm. long at most, and borne on slender sometimes thread-like pedicels up to 4 mm. long. The thin perianth-lobes are ovate, obtusish or acute, \pm 1.7 mm. long. The stamens of the two outer series are \pm 0.8 mm. long, the ovate-triangular obtuse anthers almost sessile. Those of the inner series are more narrowly ovate and borne on short filaments which have two basal suborbicular compressed glands that are sessile. The glabrous aborted gynaecium is linear, not measuring more than 0.8 mm. in length. The ♀ flowers superficially seem very much like the ♂ flowers. The stamens, however, are much smaller and seemingly sterile (not more than 0.8 mm. long), those of the inner series biglandular. The glabrous gynaecium is \pm 1.5 mm. long, the ellipsoid-subglobose ovary attenuate into an extremely brief style which bears a conspicuously three-parted stigma. The fruit is black, ellipsoid, apiculate, up to 14 mm. long and 9 mm. broad, the lower third is encased in a more or less snug-fitting hemispherical somewhat woody cupule that is about 6 mm. long, 11 mm. in diameter, and 3-4 mm. deep. The supporting pedicel is up to 7 mm. long and expanded at the tip to 2 mm. in diameter.

Neither Meissner's syntypes (except *Linden 1601*) of *Oreodaphne Sieberi* nor Nees' syntypes are available, and so for the present Mez' interpretation will be accepted, and *O. cernua* considered as a widespread species extending to the West Indies and South America.

The two nearest relatives seem to be *O. Bernoulliana*, with perfect flowers, from Guatemala, which is so similar that one suspects that it may be a different manifestation of *O. cernua* with dioecious flowers; and *O. tenera*, which also is dioecious, but whose fruits are larger and subtended by a flat shallow cupule with an undulate margin.

29. *Ocotea paradoxa* Mez in Bot. Jahrb. 30: Beibl. 67: 16. 1901; Standley in Field Mus. Publ. Bot. 18: 455. 1937.

DISTRIBUTION: Known only from the type-collection, from Costa Rica.

COSTA RICA: Alajuela: In woods near River Naranjo, alt. 200-300 m., *Tonduz* (Herb. Inst. Costa Rica) 7648 (fl., TYPE not seen).

Mez described the species as a tree or shrub with the branchlets slightly ferruginous-tomentellous at the apex, becoming quickly glabrate, brown, terete, with ferruginous- or yellowish-tomentellous buds, the cortex slightly aromatic. The petioles are up to 10 mm. long, incised-canaliculate, glabrous, supporting sparse, glabrous, chartaceous leaves entirely glabrous in the adult stage and dull opaque olivaceous-green, elliptic, the base short- or long-acute, the apex shortly or sometimes very shortly acuminate, measuring up to 13 cm. long and 6.5 cm. broad, with an almost plane margin. The venation is almost smooth or minutely prominulous-reticulate above and manifestly prominulous-reticulate beneath. The inflorescence is loose, 10-flowered, subcinereous- or subferruginous-tomentellous. The flowers are 1.2 mm. in diameter, borne on pedicels 5-10 mm. long, the bracts de-

ciduous. The lobes spread like those of *Nectandra*, and are ligulate, narrowing gradually toward the apex, finally becoming roundish. The stamens have foliaceous anthers which are acute, the connective long-produced between the cells. Those of the inner series have shortly stipitate pulvinate glands that are for a conspicuously long distance connate with the filaments. The staminodia are aborted; the ovary is ovoid, drawn out into a short conical style, the stigma is large, subdiscoid. The fruit is unknown.

Mez notes that this species is to be put in the subgenus near *O. Dendrodaphne* and *O. veraguensis*, conspicuously differing in entire habit, few-flowered and racemose inflorescence, and floral glands. It keys out to be near the last three discussed species above, but nonetheless, from the description it would seem to be a variant of *O. veraguensis*.

30. *Ocotea Matudai* Lundell in Bull. Torr. Bot. Club 69: 388. 1942.

DISTRIBUTION: Known only from type-locality.

MEXICO: Chiapas: Mt. Ovando, western slope near Escuintla, alt. 1800 m., July 1-16, 1940, *Matuda* 4221 (fl., A, TYPE — Mich, NY, US) (tree, 7 m.; flowers white).

Another species known only from the type-collection, with very slender branchlets early angled, glabrescent, and reddish, presently terete, striate, glabrous, and brownish or maculate-reddish gray. The petioles are dark reddish, slender, canaliculate, glabrous, and up to 2 cm. long. The blades glabrous and shining above, paler beneath, subcoriaceous, oblong-elliptic or oblong-lanceolate, the base obtuse to cuneate, the apex obtuse or obtusely acute, to 15 cm. long and up to 6 cm. broad. The costa is impressed above and elevated beneath. The lateral nerves, of which there are 6-9 pairs, are slightly elevated above and very prominently though slenderly so beneath, diverging at an angle of about 45-55° and bearing axillary pubescent glands beneath that are fairly conspicuous. The reticulation is conspicuous above and beneath. The inflorescence is axillary and subterminal, paniculate, glabrous to glabrescent, many-flowered, up to 7 cm. long, usually branched to the base, at most the peduncle not more than 1 cm. long. The pubescent flowers measure up to 3 mm. long, spreading to 7 mm. in diameter, borne on slender pedicels up to 4 mm. The elliptic or oblong lobes are up to 3 mm. long, pubescent within and without. The stamens of the two outer series are up to ± 1.25 mm. long, the oblong-ovate sometimes petaloid anthers only slightly longer than the filaments and sometimes bearing conspicuous connective tissue. Those of the inner series bear subreniform stipitate basal glands equalling the filaments. The staminodia are slender, thin, linear-lanceolate, ± 0.8 mm. long. The glabrous gynaecium measures ± 2.15 mm. long, the ovate slightly stipitate ovary a little longer than the rather thick style topped by a subpeltate conspicuous stigma.

The species-relationships are discussed under *O. laetivirens*.

31. *Ocotea Meziana*, sp. nov.

Arbor 7-30 m. alta, ramulis viridescentibus glabris striatis angulatis. Folia alternata, juventute canescenti-sericeo-pubescentia subito glabra, petiolis gracilibus glabris leviter canaliculatis ad 1.3 cm. longis et 1 mm. latis, laminis utrinque glabris chartaceis, in sicco viridescentibus ellipticis, ad 15 cm. longis et 5 cm. latis, basi attenuato-cuneatis, apice abrupte acuminate vel plus minusve acutis vel obtuse acutis, penninerviis, costa utrinque

inconspicue et leviter elevata, nervis 4-6-paribus utrinque inconspicue et leviter elevatis angulo 35-45° divergentibus, rete venularum supra satis subtus minute perprominulo. Inflorescentia axillaris, paniculata, ad 9 cm. longa, (?) sparse pubescentia subito glabra vel glabrescens, pauciflora, pedunculata, pedunculo ad 5.5 cm. longo glabro. Flores ad 3.5 mm. longi, pedicellis ad 3 mm. longis, gracillimis, perianthio campanulato flavescente, lobis oblongo-ovatis acutis, membranaceis, ad 2.15 mm. longis; staminibus ser. I & II \pm 2.15 (-2.6) mm. longis, pubescentibus, antheris filamentis aequalibus, ser. III \pm 2.15 mm. longis conspicue biglandulosis, glandulis antheris subreniformibus stipitatis subaequalibus; staminodiis nullis vel linearibus pubescentibus ad \pm 1 mm. longis; gynaecio glabro ad \pm 2.4 mm. longo, ovario gynaecii mididium longitudine parum excedente, stigmate discoideo parvo sed conspicuo. Fructus ignotus.

DISTRIBUTION: In the upper tropical or Caribbean rain- or cloud-forest of Costa Rica, at an altitude varying from 825 to 2100 m.

COSTA RICA: Alajuela: La Peña de Zarcero, *A. Smith H.309* (fl., Ch); Zarcero, edge of woodland, in semi-shade, in stiff clay-loam, upper tropical zone, continental divide, alt. 1615 m., *A. Smith H.359* (fl., TYPE, Ch) (tree 10.5 m., base 34 cm., bark brown, slightly roughened; leaves thin but firm, dark green above, glabrous, shining; flowers cup-shaped, oil-yellow), *A. Smith H.407* (fl., Ch); La Brisa de Zarcero, *A. Smith H.443* (fl., Ch); Villa Quesada, San Carlos, *A. Smith F.1774* (fl., Ch), *P.2596* (fl., A); Tapeseo, Alfaro Ruiz, *A. Smith P.2615* (fl., A). Heredia: Vicinity of Vara Blanca, north slope of Central Cordillera, between Poás and Barba volcanoes, *Skutch 3745* (fl., A).

This species is, as mentioned above, related to *O. laetivirens*.

32. *Ocotea pyramidata* Blake ex T. S. Brandegee in Univ. Calif. Publ. Bot. 7: 326. 1920.

DISTRIBUTION: Known only from the type-locality in Mexico.

MEXICO: Vera Cruz: Zacuapán, Nov., 1919, *Purpus 8456* (fl., ISOTYPE, GH, NY) (large tree).

The present species has branchlets dark reddish black, angled, deeply sulcate, early covered with a thin ferruginous tomentum which quickly disappears, leaving them entirely glabrous. The leaves are supported by dark slender glabrescent petioles up to 2.5 cm. long. The blades, unfortunately in both specimens at hand from the type-collection, are riddled presumably by some sort of leaf-miner. Seemingly they are glabrous above and only slightly pubescent on the lower venation, chartaceous in texture, oblong-elliptic or elliptic, the bases cuneate or cuneate-rounded and minutely and inconspicuously recurved, the apex, according to the original description, obtuse. The costa is impressed above and conspicuously elevated beneath. The lateral nerves, of which there are 8 (?) pairs, are delicately traced above and elevated beneath, diverging at an angle of about 45°. The very fine pattern of the minute reticulation is present but not conspicuous throughout the blade. The numerous axillary and subterminal racemose-paniculate inflorescences are many-flowered, subferruginous-tomentose, shortly becoming glabrescent, up to 8 (-12) cm. long, the short peduncle not more than 1 cm. long. The glabrescent to glabrous δ flowers are up to 4 cm. long, subcampanulate, and subtended by a slender glabrescent pedicel not 2 mm. long. The perianth-lobes are up to 3 mm. long, very thin, elliptic, obtuse or rounded. The stamens of the two outer series are \pm 1.5 mm. long, the ovate subrotund anthers twice the length of the

stout filaments. Those of the inner series are ± 2.15 mm. long, the subrectangular anthers equalled by the filaments, bearing two subreniform spreading subsessile glands that are almost their entire length. The aborted ovary is very narrowly lanceolate, up to ± 0.5 mm. long and topped by a subcapitate stigma.

Blake did not relate this species to any known from Mexico. It is very possible that some of the collections later described from this region may be conspecific, but it is difficult to match diseased foliage such as is found in the type of this species.

33. *Ocotea laetivirens* Standley & Steyermark in Field Mus. Publ. Bot. 23: 114. 1944.

DISTRIBUTION: Guatemala, and the forests of Costa Rica, at altitudes up to 2000 m.

GUATEMALA: Huehuetenango: Cerro Chiblac, between Finca San Rafael and Ixcán, Sierra de los Cuchumatanes, alt. 1200–2000 m., July, 1942, *Steyermark 49189* (fl., TYPE, Ch) (vine; leaves membranous, deep green above, paler beneath), *49378* (fl., fr., Ch). COSTA RICA: Alajuela: Region of Zarcero, in forest, *A. Smith H.517* (fl., Ch) (clay-loam, in forest below oak-level in shade); Guadalupe de Alfaro Ruiz, *A. Smith 4182* (abnormal fl., Ch).

This species has the young branchlets early pubescent but very quickly glabrous, conspicuously greenish, striate and angled. The leaves are supported by stout or slender (in the type) petioles 1–1.7 mm. long, often yellowish, sometimes dark, canaliculate. The blades are chartaceous, conspicuously greenish, elliptic or oblong-elliptic, the base cuneate, the apex acuminate or acutish or obtuse, usually 16 (–18) cm. long and 7 cm. broad. The costa is rather conspicuous and yellowish above, although slightly elevated, but beneath is prominently elevated. The lateral nerves, of which there are 8 or 9 pairs, are obscure above but conspicuously prominently elevated and yellowish beneath, diverging at an angle of about $45\text{--}55^\circ$. The loose reticulation is rather obscure throughout. The inflorescence is axillary, paniculate, many-flowered, early finely and inconspicuously grayish-pubescent, becoming glabrous, about 15 cm. long and borne on a peduncle up to 9 cm. long. The flowers are pubescent to glabrescent, 2–3 mm. long, the pedicels not more than 4 mm. long. The perianth-lobes are elliptic to ovate, obtusish, thick, ± 2.5 mm. long. The stamens of the two outer series are ± 1.7 mm. long, the broadly ovate anthers obtuse or rounded and not quite twice the length of the stout filaments. Those of the inner series have anthers that are more narrowly ovate, the connectives rounded and slightly projecting, the almost equal filaments bearing conspicuous globular-squarish glands about one-third the length of the entire stamen. The staminodia are ± 0.8 mm. long, very slender, attenuately linear-lanceolate, and pubescent. The glabrous gynaecium is ± 2.5 mm. long, the ellipsoid ovary nearly twice the length of the slender style that bears a small capitate stigma. The fruit is unknown, but the cupule attached to *Steyermark 49378* is woody (rose-red according to the collector), rather thinnish, campanulate, and up to 5 mm. long and 1.2 cm. in diameter, the pedicel grooved and expanded to 1.5 cm. long and 6 mm. in diameter at the apex. Both the cupule and the pedicel are brownish-verruculose.

The species, like the preceding, seems to have no near relatives, although it has characteristics in common with *O. Matudai* and *O. Meziana*. It is easily separated from both because of foliage-characters and the habit of the branchlets.

DOUBTFUL SPECIES AND VARIETIES OF OCOTEA

Ocotea insularis (Meissner) Mez in Jahrb. Bot. Gart. Berlin 5: 271. 1889; Standley in Field Mus. Publ. Bot. 18: 455. 1937.

Phoebe insularis Meissner in DC. Prodr. 15¹: 33. 1864.

DISTRIBUTION: Cocos Island, according to Pittier, characteristic of the forests of the northern and western part of the island, at an altitude of 10–200 m.

COSTA RICA: Cocos Island: Without data, *Menzier* (fl., fr., TYPE not seen), *Pittier* 16257 (fr., GH); Wafer Bay, *Howell* 10185 (fl., Ch).

This species, which seemingly inhabits only Cocos Island, has stout reddish brownish glabrous branchlets that are pronouncedly alate and striate. The petioles are about 5 mm. long, stout, canaliculate, and glabrous. The blades are subcoriaceous or chartaceous, glabrous except for the pubescent axillary glands, obovate, the base cuneate and decurrent, forming apparent petioles sometimes up to 1 cm. longer than the actual petioles, the apex very slightly and abruptly obtusely subacuminate. They measure up to 19 cm. long and 7 cm. broad, the stout costa deeply impressed above, especially near the base, and conspicuously elevated beneath. The lateral nerves, of which there are about 9 pairs, are impressed and very slightly elevated above and more conspicuously elevated beneath, diverging at an angle of 35–40°. The reticulation is fairly conspicuous on the upper surface and more prominently so on the lower. The inflorescence is axillary and subterminal, paniculate, many-flowered, and, according to Mez, scarcely ferruginous-tomentellous, up to 10 cm. long, the glabrous alate striate peduncle up to 2.5 cm. long. The flowers are 3 mm. long, minutely and sparsely pubescent, the short pedicel \pm 2.15 mm. long. The tube is conspicuous and the thinnish ovate acute lobes are \pm 2.15 mm. long. The stamens of the two outer series are \pm 1.7 mm. long, the ovate obtuse or roundish anthers shorter than the broad pubescent filaments. Those of the inner series are \pm 1.9 mm. long, the anthers subrectangular, the filaments bearing sessile subglobose glands at the base. The glabrous gynaeceum is \pm 2.4 mm. long, the subglobose (subobovoid) ovary only slightly longer than the cylindrical style with a rather conspicuous discoid (obtuse) stigma. The fruit is ellipsoid, glabrous, 13 cm. long and 6 cm. broad, and irregularly subtended by a 6-lobed rugose cupule about 7 mm. long, 9 mm. in diameter, and about 5 mm. deep, the subulate pedicel being 5 mm. long and expanded to 3.5 mm. diameter at the apex.

The affinity of this species seems to be with the group containing *O. Ira*, *O. Tonduzii*, *O. Endresiana*, etc., but the narrowly decurrent recurved blades, the variation in size and texture of the blades, among other characteristics, segregate the species. It is not included in the key, for the flora of Cocos Island is quite distinct from that of the mainland.

Ocotea psychotrioides Billberg ex Meissner in DC. Prodr. 15¹: 150. 1864.

This species is treated as a synonym of *Nectandra globosa* by Mez. Along with the type, *Billberg* 321, from Costa Rica, he also cites *Oersted* 16, 17, and 18, also from Costa Rica, which numbers may very well be syntypes of *Nectandra amazonum* var. δ *Oerstedii*. None of these have been seen for study.

Ocotea puberula Nees var. *truncata* (Meissner) Mez in Jahrb. Bot. Gart. Berlin 5: 344. 1889.

Strychnodaphne puberula var. γ ? *truncata* Meissner in DC. Prodr. 15¹: 143. 1864.

Ocotea puberula Nees, Syst. Laurin. 472. 1836, p.p.; Standley in Contr. U. S. Nat. Herb. 23: 295. 1922.

DISTRIBUTION: Known only from the type-locality.

MEXICO: Vera Cruz: Without locality, *Schiede 1142* (syntype of *Ocotea puberula*, and cited by Mez under the variety, not seen).

Ocotea sanguinea J. S. Presl, [Wšeobecný] Rostl. 2: 60. [1846].

This species, according to Mez, is synonymous with *Nectandra sanguinea*. Index Kewensis follows Mez and lists it also from Mexico and the West Indies. I have supplied the bracketed portion of the citation. The volume in question does not contain *Ocotea sanguinea*, although two other *Ocoteae* are mentioned. Possibly the following reference is meant, even though the entity to which Mez has referred *Ocotea sanguinea* does not occur in Bohemia, the locality taken up in Berchtold and Presl: Berchtold, F. G. von, & Presl, J. S., Prirez. Rostlin, 3 vols. 195. pl. 1823 [-35].

SPECIES AND VARIETIES EXCLUDED FROM OCOTEA

Ocotea Brenesii Standley = *NECTANDRA* sp.

Ocotea campechiana Standley = *LICARIA CAMPECHIANA* (Standley) Kostermans.

Ocotea Cufodontisii O. C. Schmidt = *NECTANDRA* sp.

Ocotea globosa Schlechtendal & Chamisso = *NECTANDRA GLABRESCENS* Benth.

Ocotea helicterifolia (Meissner) Hemsley = *PHOEBE HELICTERIFOLIA* (Meissner) Mez.

Ocotea latifolia H.B.K. = *NECTANDRA LATIFOLIA* (H.B.K.) Mez.

Ocotea mexicana (Meissner) Hemsley = *PHOEBE HELICTERIFOLIA* (Meissner) Mez.

Ocotea mexicana var. α *subsessilis* (Meissner) Hemsley = *PHOEBE HELICTERIFOLIA* (Meissner) Mez.

Ocotea mexicana var. β ? *longipes* (Meissner) Hemsley = *PHOEBE HELICTERIFOLIA* (Meissner) Mez.

Ocotea mexicana var. γ *diminuta* (Meissner) Hemsley = *PHOEBE HELICTERIFOLIA* (Meissner) Mez.

Ocotea perseifolia Mez & J. D. Smith = *NECTANDRA* sp.

Ocotea psychotrioides H.B.K. = *PHOEBE PSYCHOTRIOIDES* (H.B.K.) Mez.

Ocotea rubriflora Mez = *NECTANDRA* sp.

Ocotea salicifolia H.B.K. = *NECTANDRA GLABRESCENS* Benth.

Ocotea Salvini Mez = *PHOEBE SALVINI* (Mez) Lundell.

Ocotea striata Buck = *MYRODIA* cf. *FUNEBRIS* L. (ex Gürke), fide Mez.

Ocotea subtriplinervia (Meissner) Hemsley = *PHOEBE SUBTRIPLINERVIA* (Meissner) Standley.

Ocotea tampicensis (Meissner) Hemsley = *PHOEBE TAMPICENSIS* (Meissner) Mez.

Ocotea Whitei Woodson = *NECTANDRA* sp.

(To be concluded)